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EDITORIAL

Animal Husbandry in Malaya.

The third article in this series appears in this issue of the Journal. The first two articles were published in the issues of July and October, 1947, and together formed Section 1 of the series under the title of " Cattle in Malaya." The present article includes two further Sections: 2, The Buffalo in Malaya, and 3, The Selection of Breeding Stock in General.

In Section 2 a description is given of the Malayan kerbau or water buffalo and of the Indian Surti or Murra buffalo. The kerbau is the buffalo used by the Malay padi planter, and is particularly well suited for work in the wet padi fields. Chinese wood-cutters also use it for timber-hauling in the jungle. For the improvement of the water buffalo more attention must be given to feeding and breeding, and the authors suggest methods by which adequate supplies of fodder could be maintained and also the lines breeding should follow.

The Indian buffalo is kept chiefly for milk production but is also used by the Chinese for timber-hauling. In contrast with the kerbau, which is a swamp-loving animal, the Indian buffalo requires dry grazing grounds and is not suited for work in the padi fields. As in the case of the kerbau a major problem is to provide sufficient fodder or adequate grazing grounds.

The second part of Section 2 deals with the selection of buffaloes, and in the case of the Malayan kerbau is based on notes written by Mr. R. Macgregor, formerly a member of the Malayan Veterinary Service.

It is clear that for an adequate improvement of stock of any kind attention must be paid to breeding. Much has been done in the past by the Department in the development of the pig population of Malaya by the introduction of pure-bred stock for upgrading purposes, and pedigree milch goats, recently imported from the United Kingdom, should likewise do much to improve the local goat. Improvement by breeding and selection is, however, a long term objective and rapid results cannot be looked for. The authors of the article under consideration point this out in Section 3 which deals with the selection of breeding stock in general, providing a valuable guide to this important subject.

Off-Season Crops on Padi Land.

Considerable attention has been given since the war to the development of vegetable production on padi land during the off-season. The urgent need for the increased production of foodstuffs in this country has stressed the necessity for making the fullest use possible of agricultural land.

The use of padi land during the fallow season is not a new development. It was practised in Malacca and Kelantan, and to some extent in Penang and Province Wellesley before the war. In the issue of this Journal for July, 1947, the results were given, from records still available, of pre-war experiments carried out on the Bukit Merah Padi Test Station. In the present number an article records current practice in Malacca where off-season cultivation has increased considerably since the war. In the last fallow season over 1,000 acres of padi land were under cultivation, mainly by Chinese. The exportable surplus of vegetables during the peak months was estimated to be 5,000 to 6,000 piculs per month which represents a valuable addition to the food resources of Malaya.

In addition to the lack of economic urgency, the development of fallow season cultivation has doubtless been delayed by the danger of losing soil fertility through intensive cultivation without adequate application of manure. In Malacca, however, some areas have continuously produced off-season vegetable crops in addition to the main padi crop for nearly 30 years with no apparent loss in soil fertility, and in other parts of the country improved padi crops have resulted from the cultivation of the padi fields during the fallow season. Soil fertility was maintained, however, by the application of manure.

This is undoubtedly a development of small-holding agriculture that deserves the fullest encouragement.

Padi Cultivation during the Occupation.

The article by Mr. Van Thean Kee, a Chinese Agricultural Assistant, on the cultivation of Taiwan padi in Perak during the occupation gives an interesting account of Japanese efforts to increase rice production by the introduction of new varieties of padi with new methods of cultivation, and makes clear their failure to do so successfully due to their inability to appreciate essential differences in conditions between Taiwan and Malaya.

The Department of Agriculture has not neglected the opportunity to investigate the possible value of Japanese varieties as permanent introductions, and one or two strains have, in fact, produced very high yields when cultivated in the particular Malayan conditions to which they are suited.

The Manufacture of Tea.

Tea has been grown commercially in Malaya since about 1927 and is now well established both on the highlands and the lowlands. The development of tea planting was brought to a standstill by the International Tea Agreement of 1934 which Malaya entered in 1936, and further accepted for the period 1938-43. At the present time, however, no such restriction on planting exists.

The Department of Agriculture has experimental plantations at the Central Experiment Station, Serdang, and Tanah Rata Experiment Station, Cameron Highlands, where the experimentation has been on the lines of cultivation; the leaf grown on these plantations has been made into tea in factories equipped according to the normal commercial practice, and fundamental research into tea manufacture has not been undertaken. Hence it is thought to be of interest to place before our readers information regarding the very important investigations into tea manufacture which have been made in the Tea Research Institute of Ceylon at St. Coombs.

In an article in this issue Dr. T. A. Buckley, Senior Chemist, presents a composite abstract of articles in the publications of that Institute in which fundamental changes in manufacturing methods are discussed which deserve the careful attention of the Malayan tea industry.

Mechanical Cultivation Demonstration.

The January issue of this Journal was a special mechanisation number devoted to summarising the work of the Department in connexion with the possible development of mechanisation in Malayan agriculture. A logical outcome of that work was a demonstration of mechanical cultivation which was given at the Central Experiment Station, Serdang, in January.

An account of that demonstration appears in this issue, illustrated with photographs, and shows the interest aroused in the possibilities of agricultural mechanisation. While it must again be emphasised that the investigations by the Department have been of an exploratory nature, nevertheless the demonstrations showed that certain operations, such as methods of felling oil palms and of ploughing and disc-harrowing in secondary jungle growth, are already suitable for practical application to local problems.

Original Articles.

ANIMAL HUSBANDRY IN MALAYA (*Continued*)

2. The Buffalo in Malaya

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It was pointed out in an earlier article in this series that there are two chief types of buffalo in Malaya: (a) the wide-horned kerbau or water buffalo, and (b) the curly-horned Indian Surti or Murra buffalo, both of which are used for haulage and for the production of meat and milk.

The Malayan Kerbau or Water Buffalo.

The kerbau is of Siamese origin, and formerly large numbers were imported into this country annually both for haulage and slaughter. This trade is now moribund owing to the prohibition of importation in connexion with disease control.

The general appearance of these animals is too familiar to require much mention. The predominating colour is black, but a few animals have pinkish skin and whitish hair. While the hair of young animals is usually very profuse, mature animals are normally almost hairless and, compared with the Indian buffalo, they have more compact bodies set on shorter legs.

The kerbau is not yet a highly specialized animal and consequently exhibits many of the characteristics of its wild ancestors. It is a swamp-loving animal and preferably nocturnal in habit, tending to suffer if worked or exposed in the full heat of the day. It is well adapted, therefore, for working in the close humid atmosphere of the jungle, for example in timber hauling, and for the cultivation of wet padi fields, and is able to exert a heavy pull on soft ground, though it is a slow worker. In padi cultivation it possesses the valuable characteristic of stepping over bunds instead of on them. It thrives on rough pasture, providing this is adequate, and is in general a hardy useful animal.

The kerbau does not breed freely in Malaya, probably due more to neglect in care and feeding than to any climatic factor. It is estimated in some quarters that the average cow produces only one calf in from 2 to 2½ years. As a rule the peasant takes little trouble to notice if his buffalo cows are on heat and seldom makes the effort of taking them to a bull for service. Cows on heat are usually turned loose in the hope that they will

encounter a bull and obtain service, but, as bulls are frequently tethered to prevent them from straying, many cows must come on, and go off, heat without being served, thus lowering the rate of reproduction. It is known that with reasonable management two calves can be produced every three years. The gestation period is about 10 months, the normal calving season being July to September.

The kerbau is essentially the Malay small-holder's animal; he uses it either for puddling or ploughing his padi *sawahs* prior to planting and for meat. In Kedah and parts of Perak, Malays claim that the flesh of this animal is preferable to that of the Indian buffalo and that its milk also is superior, whether taken as liquid or used for making ghee. Although Malays generally do not milk their buffaloes, milking has long been common in Province Wellesley and parts of Kedah. Such milking is as a rule commenced about 40 days after calving and is continuous for about 7 months. The animals are milked once a day only and yields average about 3 pints a day for the first 2 months, falling to about 1½ pints for the remaining 5 months. About 50 gallons of milk are produced during the 7 months lactation and this figure could be increased to a considerable extent by more regular and frequent milking. Such milk is as a rule sold to higglers who in turn sell it either as liquid milk or, after processing it, as ghee or tairu. As a rule, however, the cows are poor milkers and normally provide very little excess over that required by the calf.

In some parts of the country well-grown bulls, which reach their best condition for haulage at about seven years of age, are preferred for this work, while in others females are preferred for ploughing, owing to their greater docility.

The kerbau is used also by Chinese wood-cutters for hauling timber in the jungle and stands up to such work very well when adequate rations are provided. These timber-hauling kerbau are as a rule much better cared for than padi cultivators' animals; their owners usually ensure that a sufficiency of fodder is available and they supplement it with concentrates. As a result, such animals are normally in very good condition and are said to be more immune to disease than kerbau kept by Malays.

Some authorities are of the opinion that as Malaya becomes more developed the kerbau will slowly be replaced by the more specialized Indian buffalo. It is probable, however, that the kerbau will always find a place in connexion with padi cultivation and there is no apparent reason why, with more attention to feeding and breeding, these animals should not be considerably improved. Perhaps the greatest feeding problem is that of securing adequate year-round supplies of fodder. After the padi is planted, the animals are as a rule prevented from entering the *sawah* areas (wet padi fields) and thus are deprived of their natural pasturage and wallows. During the padi season they are frequently allowed to ramble over the countryside uncared for, and as a consequence rapidly lose condition and become more liable to pick up disease, such as rinderpest. While it appears

likely that this fodder problem will ultimately be solved only by laying aside areas, either individually or collectively, for the growth of fodder or grazing crops, much could be done immediately if a greater proportion of owners would take the trouble to find and cut fodder for their animals during the " hungry " season and, possibly, to supply some supplementary concentrates at the same time. In some of the more crowded padi-growing districts the peasants do make a serious attempt along these lines, cutting as much as from 30 to 40 katis of fodder per animal per day from the edges of ditches and swamps, but this practice is not widespread. There is little doubt that the animals would repay such attention by breeding more often, by growing more rapidly in the case of young stock, and in general by being better and healthier stock.

In respect of breeding, there is also little doubt that intelligent selection of the parent stock and controlled mating would lead to improvement. Selection should be based chiefly on stamina, vigour and size; but milk yields and heat resistance might also be considered. Controlled breeding would entail castrating the undesirable males, or segregating them from the females before reaching sexual maturity, but the trouble and expense involved would probably be more than amply offset by the resultant improvement of the progeny; and if improvement in breeding were accompanied by adequate feeding there is little reason to doubt that the kerbau would long continue to figure largely in the future animal husbandry of this country.

It is to be hoped, too, that in future the Malay small-holder will become less reluctant to sell his animals than in the past. A more progressive attitude in this respect would provide, among other things, for the maintenance of a better balance between the sexes and for the conservation of the limited pasturage available. It is obvious, of course, that sales must not be carried to such a pitch that a shortage either of male or of female breeding stock results. Surplus animals should, however, be sold and not retained merely to enhance the owner's prestige or out of apathy. The current custom, also, of failing to make any domestic use of the small quantities of milk that are available or agricultural use of the manure that might be collected are equally to be regretted.

The Indian Surti or Murra Buffalo.

The Indian buffalo resembles the kerbau in general appearance except that its horns are usually spiral instead of gently curved, and it has somewhat longer legs. Colours are mostly black, and it is a hardy animal, being more specialized than the kerbau and having a wider range of usefulness.

While the kerbau is essentially a swamp-loving animal the Indian buffalo requires dry grazing grounds and prefers clean water. Although it is a somewhat stronger animal than the kerbau and stands the heat better, it requires more care and better food and is not suited to soft swamp work, becoming helpless if it sinks above the knee, and tending to break

down bunds. It thrives best when allowed access to shade during the heat of the day; early morning and late afternoon are therefore the favourite grazing times, while it is customary for these animals to bathe for about two hours daily.

Indian buffaloes mature sexually at from 3 to 3½ years of age and both males and females are used for breeding from then on. The males are used until they are about 10 and the females 15 years old, one male being sufficient for about 50 females. The gestation period is about 10½ months and, while in theory a more rapid rate of reproduction is possible, the average interval between successive calvings is from 16 to 18 months under local conditions. The calves of the Indian buffalo are said to be delicate, and a fairly high rate of mortality is reported. This may be due to inadequate or faulty feeding or to internal parasites, or both, and is a field for future investigation. The average cow under these circumstances gives birth to 7 or 8 calves in her breeding lifetime. Allowing for the prevalent local custom of allowing the calf about a quarter of the total milk produced, it is said that the best cows might be expected to yield about 300 gallons of saleable milk during the lactation period, which lasts up to 10 months. The best cows might average 3½ gallons a day for the first few months after calving. The highest yield is usually received during the third lactation and the milk generally is very rich, containing up to 9 per cent. butter fat. Production of this nature can only be sustained by some attention to feeding and it is the practice among Indian dairymen to feed concentrates from the age of 2 months. A typical daily ration for a mature animal is as follows:—

Rice bran	—	2 lbs.
Broken rice	—	2 ,,
Sesame cake	—	2¼ ,,
Salt	—	2 ozs.

The Indian buffalo in Malaya is kept chiefly by Northern Indians with a view to milk production, surplus milk being converted into ghee. Surplus animals are sold for meat, while strong individuals are favoured by Chinese for timber hauling in the jungle. The Indian herdsman also conserves and sells as much manure as possible, this ensuring a small but steady supplementary cash income. These herdsmen are not unacquainted with the more elementary principles of breeding and it is the rule for them to make some attempt at the selection of breeding stock. Males are usually chosen on a basis of their strong physique and vigour; females partly on the milk yields of their dams, and partly on general considerations of size and health.

As a consequence, the Indian buffalo is more highly specialized than the kerbau and is considered by most authorities to be generally superior for draught and dairy purposes. It is very popular at present in States such as Selangor and Perak and, while it will probably never become adapted to soft swamp padi cultivation, its distribution is gradually extending and

it is felt in some quarters that as Malaya becomes more settled and developed. the Indian buffalo will tend generally to replace the kerbau. In this connexion, however, it should be remembered that the kerbau has yet to show its capabilities under the influence of better feeding and selective breeding, and only the future will show what balance should be held between the two types of buffalo.

While the selection of breeding stock undoubtedly requires more emphasis than at present, probably the outstanding problem, as in the case of the kerbau, is to secure a sufficiency of fodder or adequate grazing grounds. Indian cattle keepers estimate that from 1 to 3 acres of rough grazing are required for each adult. Dairy herds, on the other hand, are maintained almost exclusively in the neighbourhood of the larger towns, where there is a ready sale for milk, and the high value and relative scarcity of land surrounding such towns suggests that these herds will have to be maintained on grazing areas at greater distances from the towns, and the milk produced will require to be transported to the centres of population.

In conclusion, the buffalo is a heavy, strong though somewhat slow animal. It can exist, if not exactly thrive, on coarse food of low nutritive value, providing this is adequate in quantity, and is useful for haulage, slaughter and milk-production. The buffalo is considered by many to be a much more efficient dairy animal than the Indian ox (*Bos indicus*), the high fat content of the milk making it particularly valuable for ghee-production. In common with other types of indigenous livestock, however, there is great room for improvement in respect both of feeding and breeding, and we shall return to this point later.

The Selection of Buffaloes.

The Malay wide-horned kerbau and Indian curled-horn buffalo are in the main " triple purpose " animals. The prime function of the former is that of draught, surplus or culled animals being disposed of for slaughter, while milk production, though of some importance in certain districts, is generally a very poor third in the owner's estimation. The prime function of the Indian buffalo, on the other hand, is that of milk-production, surplus or culled animals being sold for slaughter or, if good quality bulls, for draught purposes.

It has already been pointed out that there are well recognized, distinct types of animals, e.g. the dairy type, the draught type and the beef type, and that good specimens of each type exhibit certain special (phenotypical) features which enable one to judge and select them. To a considerable extent the " points " of each type differ from each other. Good dairy cattle, for instance, possess a body-shape, fineness and quality which would be regarded as serious faults in a purely draught animal, while even in the case of draught and beef cattle, which resemble each other to a certain extent, there is yet a certain amount of contradiction. This contradiction in type-characteristics explains why it is impossible to find or produce the

perfect " all in one " animal; outstanding performance in one respect can be obtained only by sacrificing something in other directions, i.e., it can be obtained only by specialization.

The student of animal husbandry naturally will wish to know something about the three main types of horned stock, even though the stock in this country is at present of a general rather than special character. He will also require to know how to select good individuals of the various kinds of horned stock found in this country. Hence in the following notes the beef and draught types are described, and afterwards the practical points that can be considered when selecting buffaloes, particularly the Malay kerbau. The dairy type will finally be commented on; a knowledge of this type will aid the selection of milch animals, whether these be cows or buffaloes. Consideration will follow of the problem of selection of horned stock by a brief survey of milk recording.

The Beef Type of Animal.

The general characteristics of the beef type are as follows:—

Head—

Broad, wide between the eyes. Muzzle broad and deep, indicating good constitution and capacity. Hair on head and ears fine and silky, indicating good quality.

Neck—

Short, broad and deep, blending smoothly into the forequarters.

Body—

Rectangular and blocky in shape, of ample size, well covered with firm as distinct from soft, fatty flesh. Forelegs set well apart, body width being carried uniformly from front to rear, and no tendency to depression immediately back of forelegs. Depression indicates lack of constitutional vigour. Ribs accordingly should be well-sprung, allowing for good lung and heart space and deep chest. Forelegs short, straight and strong; loins long, broad and level, thickly fleshed. Hindquarters long, smooth and well-fleshed. Hair fine and silky, hide soft and flexible.

General—

The masculine and feminine characters of bulls and cows should be well-differentiated. The bull should possess a virile, bold, masculine head and should be altogether a bigger and larger-boned animal than the cow. He should carry a strong impression of maleness throughout. The cow should be finer in general appearance, head slightly narrower and longer than in the bull, and the body in general smaller in size and bone.

Now examine the following score card, which is a typical example of those in use for judging beef cattle, and note the degree of importance attached to each feature according to the number of marks awarded to it:—

Score Card—Beef Breeding Cattle.

Scale of Points.

			Perfect Score
General Appearance—30 points.			
Weight	—	Estimated .....lbs., Actual .....lbs., Score to age ..	4
Form	—	Straight topline and underline, deep, broad, low, medium length, symmetrical, compact, standing squarely on legs ..	7
Quality	—	Bone of firm texture, fine skin, silky hair; clearly defined features and joints; mellow, tough ..	6
Flesh	—	Healthy, naturally thick, firm and smoothly fleshed, especially in regions of valuable cuts ..	5
Style	—	Active, graceful carriage ..	1
Temperament	—	Male, aggressive but not vicious; female, quiet, docile ..	2
Breed Character	—	..	5
Head and Neck—10 points.			
Muzzle	—	Good size, lips thin, nostrils large, wide apart, jaws wide ..	2
Face	—	Short, broad, profile straight ..	2
Eyes	—	Large, full, clear, bright ..	1
Forehead	—	Broad ..	1
Ears	—	Well carried, fine, medium size ..	1
Neck	—	Thick, short, throat clean, dewlap slight ..	3
Forequarters—10 points.			
Shoulder Vein	—	Smooth, full ..	2
Shoulders	—	Smoothly covered with firm flesh, compact ..	4
Brisket	—	Broad, full, breast wide ..	2
Legs	—	Straight, short, strong, wide apart; forearm full; shank fine, feet sound	2
Body—30 points.			
Chest	—	Deep, broad, girth large, foreflank full ..	6
Crops	—	Full, thick, even with shoulders ..	4
Back	—	Broad, straight, medium length; thickly, evenly and firmly fleshed	6
Ribs	—	Deep, well sprung, closely set, thickly, evenly and firmly fleshed	6
Loins	—	Broad, straight, thickly, evenly and firmly fleshed ..	6
Flanks	—	Medium, full, low ..	2

			Perfect Score
Hindquarters—20 points.			
Hips	—	Smoothly covered, proportionate width ..	2
Rump	—	Long, level, width well carried back, thickly, evenly and firmly fleshed ..	5
Pin Bones	—	Wide apart, not prominent ..	1
Tail	—	Fine, tapering, medium length ..	1
Thighs	—	Deep, wide, well fleshed ..	4
Twist	—	Deep, broad, well filled ..	5
Legs	—	Straight, short, strong, shank, smooth feet sound ..	2
		Total	100

The Draught Type of Animal.

A good draught animal, according to most authorities, is large in size, heavy in front and possesses a sloping rump. Many of the best beef breeds of cattle were developed from what was primarily draught stock and accordingly we find that most of the points of a draught animal are very similar to those of the beef animal. Perhaps the most important exceptions are in length of leg and sloping rump. A draught animal obviously requires longer legs than a beef animal, while the sloping rump, i.e. a topline which falls away from the top of the pelvis to the root of the tail, is usually considered preferable to a straight topline for draught purposes. The two types also differ in temperament. In general, the beef animal is of a placid, docile disposition, well adapted for converting its food into body flesh. The draught animal, on the other hand, should possess a more willing and active disposition. In selecting a draught animal, particular attention should be paid to the hoofs, which should be hard and tough to withstand roadwork and the frequent attachment of shoes, and animals should be avoided which have a heavy pendulous dewlap and sheath.

Selecting the Malay Kerbau*

The best prices are paid for animals which are fit for timber hauling, and since such animals are also most suitable for the peasants' own draught purposes, breeding should be directed to producing such animals. Those that do not reach a reasonable standard can always be sold for meat.

The points of a good hauler are: large head, thick neck with well developed hump, heavy shoulders, with thick short legs set wide apart, and

* The information under this heading is based almost entirely on notes provided by Mr. R. Macgregor, of the Malayan Veterinary Department, to whom we are accordingly indebted.

broad round hoofs. Minor points are short, thick horns and a long tail with good " feather " (hair).

Common faults are as follows:—

(a) Legs set too close together. In front this gives the appearance of knock knees and poor chest capacity. Behind, the scrotum is seen to be twisted round sideways like that of a dog.

(b) Hoofs oval instead of semi-circular. Such hoofs sink into the mud and cannot be withdrawn easily.

(c) Thinness. Buffaloes carry very little subcutaneous fat and a thin animal therefore is one lacking in muscle. Such animals are of little value for draught purposes.

Since the conformation as a rule alters considerably with growth, it is impossible to select the best (future) haulers while animals are still in the calf stage. They should accordingly be left uncastrated until ready for work, i.e. until they are about 5 years old, steps being taken, of course, to prevent promiscuous mating. Castration is held to spoil the hump and shoulder growth essential for a hauler. At this age, poor types should be culled for immediate slaughter.

In selecting kerbau cows it is most important to keep the objective in mind, for it has been pointed out previously that while the draught and beef types resemble each other the dairy type differs widely. If interest is in the production of draught-cum-beef stock, therefore, cows possessing the corresponding points should be selected. At the same time, such cows must be able to suckle their young, i.e. milk production is an essential part of the reproductive process, and " dairy points " cannot therefore entirely be neglected. Accordingly cows would be selected which conform generally to the beef/draught type and at the same time possess such dairy points as a good udder and teats. If the development of a herd of milking kerbau is desired, on the other hand, then it would be necessary to select largely for dairy points. Briefly, the body should be long, legs long and thin, head, neck and shoulders light, hips wide, udder large, with four long teats, set well forward.

Considerations would also be given to factors such as stamina, temperament, and ability to tolerate the heat of the day, if necessary.

Selecting the Indian Buffalo.

Most Indian buffaloes in this country are of the Surti or Murrah type, or are mongrel specimens of these types. Such animals here are kept almost entirely for milk production, the bulls generally being inferior to the large type kerbau for draught purposes. Indian buffaloes should therefore be judged like any other dairy cattle, a procedure which forms the subject of the following section.

3. The Selection of Breeding Stock in General.

Regardless of the particular system of breeding adopted, the improvement of livestock by breeding is based on the simple principle that "Like tends to beget like." On this basis, superior sires and dams tend to beget superior progeny and we see that the breeders' chief problem therefore is that of selecting superior stock for mating, a problem which must be solved by all successful breeders, whether they are operating on a large scale with pedigreed herds or are simply the owners of a few head of stock.

"Superior" sires and dams are those that are *superior to the average* of the breed or type, from which it follows that the first essential in selection is a knowledge of what constitutes this average. The breeder therefore should, in general, have a sound knowledge of the breed or type with which he is working and should in particular possess a thorough knowledge of his own individual animals. Given this, the breeder is in a position to judge and place animals "within the breed" or type, and to decide whether any particular individual is worth using for stud purposes within his own herd. The second essential for the breeder is to have a clear mental picture of his own objective, a definite mental image of the kind of animal he intends to produce, or, in other words, his ideal. This ideal should not be too ambitious. If it is so, then disappointment will almost certainly accrue.

Improvement by breeding is a lengthy process and it requires considerable patience to achieve even a modest degree of improvement, particularly in the case of animals like the cow, say, in which long periods elapse between impregnation, birth, and maturity. In connexion with this question of ideal, it is also essential to realise at the outset that one cannot have all the best qualities in one animal. A high degree of specialization in respect of one character, e.g. milk production, can as a rule only be achieved at the expense of other characters, e.g. draught or meat. Because of this, it is not an easy matter to determine the ideal in the case of multi-purpose animals, requiring a fine sense of discrimination in deciding the extent to which each of the three characters mentioned are to be combined (it is hoped) in the ideal. In practice, the first step is to decide which particular character requires the greatest emphasis and then to select primarily for that character, while ensuring that the stock thus selected are at least average in respect of the less important characters.

Therefore the successful breeder of any particular breed or type of stock must first clearly establish the ideal towards which he is going to work, and to do this he must combine a general knowledge of that breed or type with a particular knowledge of his own stock. Finally, to select superior individuals, he must be a good judge of stock, i.e. he must be able to recognize a good animal when he sees it. In addition to the above he must be patient, realising that it may take him decades to reach his ideal. The fund of knowledge mentioned above cannot be obtained from books alone; the theory can be obtained from that source but, in addition, a large

measure of practical experience is obviously required, and this can be obtained only by long association with stock. It has well been said: " The best breeders live close to their animals ", for only close association and study can develop that skill of eye and hand which amounts almost to an instinct in a good stockman.

Types of Animals.

The student of animal husbandry frequently encounters expressions such as the following: " dairy type ", " beef type ", and from the point of view of selecting breeding stock the first essential is to acquire a clear idea of what is meant by " type " as used in this connexion.

The first thing to realise is that domestic animals are *functional*, i.e. they are reared to perform specific services, such as the production of milk, meat or work (haulage). Animals vary greatly in their ability to perform the function(s) for which they are kept. The best dairy cows of any given breed, for example, produce many times more milk than the average of their breed; the best beef cattle grow more quickly and slaughter to a higher proportion of the more valuable " cuts " of meat than do ordinary animals, and so on. Such superior animals, environmental factors being equal, are superior simply because they have inherited the factors which make for superiority from their parents, in accordance with the laws of genetics. The stock-breeder, however, is rarely a geneticist and it is accordingly more important from the practical point of view to realise that a superior genetical inheritance almost invariably expresses itself phenotypically, i.e. in the shape, size and quality of various parts of the body and in the conformation of the body as a whole. Now these phenotypical characters can be seen or, as in the case of skin or hair quality, for example, felt, and by the visual and tactile examination of an animal it is possible to assess its value. Such examination is at the basis of all livestock judging. Again, since superior animals of any given kind must obviously have received a similar genetical inheritance (i.e. they are genotypically similar), and since such inheritance expresses itself phenotypically, it may be realized that superior animals of any given type will in general tend to resemble each other; they will tend to have many characteristics in common. Such is very definitely the case; the desirable characteristics and features typical of good stock are now well known and an individual which possesses them to a noteworthy degree is said to be of a given type. Thus, a cow or heifer which possesses in large measure those features which characterize the best dairy stock is said to be " of good dairy type ", and similarly for other kinds of stock.

Score Cards.

The first principle in judging, whether livestock or anything else, is that one must have a standard of comparison; something with which all other things of the same kind can be compared. In some cases, the most convenient standard is represented by the *average* of the varieties being

studied. It has been shown how important it is for a breeder to possess a thorough knowledge of the average of the breed or type of animals with which he is concerned, if for no other reason than that of restraining him from setting up too high an immediate breeding objective. When judging individual animals, however, or when attempting to measure the relative value of each of a group of animals, it is more convenient as well as being the convention to adopt *perfection* as the standard of comparison.

Outstanding breeders and scientists have collaborated in defining and describing the perfect animal of any given type. They have described in detail the features which it should possess, and when these are put down on paper in logical order and marks are allotted to each in accordance with its importance, the result is a " score card." In European and American countries each breeding association has evolved its own score card. Thus, there are separate official score cards for all the chief breeds of stock, and it is customary to use the corresponding card when judging animals of any given breed. Such cards, however, tend rather to be too restricted in that their main use is that of helping the judge to assess how a given animal compares with the perfect example *of its own breed.* Such cards have to take into account fancy points such as colour and shape of horn which, while held to be of importance from the standpoint of the breed, vary from breed to breed and in any case have no bearing at all on an animal's productive efficiency. Because of this, " utility " score cards have been evolved. These emphasize the features which all good individuals of a particular type should possess, and neglect purely breed characteristics. Because of this, utility score cards for any given type can be used for all individuals of that type, regardless of the breed to which they belong.

It should perhaps be mentioned that livestock are frequently judged without score cards being used. Cards are of the greatest value to the young judge, since they direct his attention to the important " points ", and beginners accordingly should always use them. They are of value also to the expert when judging stock at fairs and exhibitions, since the markings entered thereon constitute the reasons for any particular placing in order of merit, and can accordingly be referred to in case of dispute. The experienced breeder, however, knows automatically what to look for when selecting animals for his own particular purposes and in such circumstances the use of cards would be very rare indeed.

Records of Performance.

Our discussion of selection thus far has largely been concerned with selection based on external appearance, shape and conformation, i.e. on visual and tactile characteristics. While these are of very great importance they do not in themselves provide all the information that is desirable, and to obtain a complete picture the breeder should also study any available records of performance in respect of the animals under consideration.

The stock in Malaya under consideration, excluding poultry, are in the main kept for the production of milk and meat and for work. In selecting such stock, therefore, attention should be paid to their performance in respect of these types of production. In the case of pure-bred dairy cattle, for instance, milk production records of the animal and its female progenitors on either side of the family tree would normally be available and would be of the greatest value. In the case of native-owned dairy stock, however, written records cannot be expected at present and judgment would have to be based instead on the owner's statements, his reputation for veracity, and so on, though a few milkings could, of course, be attended in order to obtain a rough check. Coming to beef and draught animals, on the other hand, the position is not so easy because in their case there is nothing quite so concrete as a straightforward record of milk production. In the case of beef stock judgment would be influenced to a large extent by growth-rate and weight at maturity; but in the case of draught stock reliance would have to be placed almost entirely on visual phenotypical characteristics, since it is impossible under ordinary conditions to measure an animal's capacity for performing physical work. Temperament, for instance, is very important. A dairy cow that is producing well must have a good temperament for milk-production, or she could not be a good producer; a big, strong draught animal, on the other hand, might be lazy and hence inferior as a draught animal to a smaller but more willing beast. In selecting draught stock, therefore, it is advisable to observe them when working under hard draught conditions and not to rely solely on their general appearance.

Wastage.

The stockman uses this term, roughly speaking, to indicate the losses that occur in his herds. These losses may be due to death by accident or disease, to sale, or to the elimination of animals by culling those which are sub-average or otherwise undesirable. From the standpoint of breeding, excessive wastage, no matter what its cause, is detrimental since it allows but little chance of selection over and above ordinary replacements required for the maintenance of the numerical strength of the herd. It is therefore generally safe to state that not a single animal should be disposed of unless the breeder is quite satisfied that it can find no place in his breeding programme.

FALLOW SEASON CULTIVATION OF IRRIGATED PADI LAND IN MALACCA

BY

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The cultivation of wet padi land during the normal fallow season for vegetable production is no new development although its scope, particularly in Central and Alor Gajah Districts, has been enormously increased during and since the war. In the mukims of Tranquerah and Lorong Pandan, for instance, there are sizeable areas of *sawah** which have been continuously cropped thus, together with a main padi crop, for upwards of 30 years with no apparent loss in soil fertility. They provide an outstanding example of what can be achieved with suitable Malayan soils provided sound husbandry methods are followed. In the true sense of the word the cultivators of these particular areas are " real " farmers and their systems, evolved after many years of trial and error, are well worth a comprehensive study.

Of the current season's estimated aggregate of over 1,000 acres under this form of cultivation, 25 acres approximately were cropped by Malays, the remainder being the work of Chinese. Admittedly this is a very small proportion; nevertheless it is of interest that a few Malays have actually adopted the methods of the Chinese, copied the types of implements used, and generally followed along similar, if not such intensive, lines. The Malays still have, however, a very long way to go before their efforts are on a par with the highly skilled, industrious and opportunist Chinese. One outstanding difference between the two is the method of disposal of the produce. By mutual co-operation the Chinese have developed amongst themselves a highly organised marketing system catering mainly for the Singapore and Kuala Lumpur markets while the Malays, possessing less business acumen, have remained content to cater for local customers.

These notes do not purport to be a full account of this very important development in local farming; most of the farmers are illiterate and more often than not suspicious of too detailed inquiries to allow of information being readily obtained. Gradually their confidence is being won by frequent meetings, and together with the maintenance of a spirit of close co-operation between the Department and the recently formed Chinese Food Growers' Association should eventually result in the procurement of useful and accurate information. This Association, after several months of preparation was formally inaugurated on 1st June, 1947. To-date its activities have been mainly concerned with the safe-guarding of its members against

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* *Sawah* = irrigated padi land.

exploitation by middlemen, but the final aim is for it to function as a Co-operative Society. Its formation is a sign of the times and reveals a sense of awareness of the benefits of co-operative marketing and bulk purchase.

It is in the Central and Alor Gajah Districts that fallow season cultivation is most actively pursued. Holdings vary in size from 5 to 12 acres but generally one of 2 acres is favoured, the latter being capable of providing a living for a typical average-sized Chinese family, i.e. two to three adults with four or five children. As may be expected high land is at a premium and in the absence of any small areas of naturally high ground a few square chains sufficient to accommodate an attap roofed dwelling house, a few small shelters to function as housing for anything up to 20 pigs, one or perhaps two buffaloes and a few head of poultry, are artificially raised 1 to 2 ft. above normal water level. Houses are never built on raised foundations. (Plate I). Although water for all purposes is drawn from an open well near the dwelling house, no particular precautions appear to be taken against the ever present danger of contamination. For partial shade and to help eke out the family budget, a few coconut and fruit trees are usually to be found on these small congested areas of high land.

The pig population now to be found on these holdings is much less numerous than before the war, a state of affairs accounted for by the prevailing high cost of fattening which leaves no margin of profit. Whereas, therefore, pig manure previously provided the bulk of the organic manure used for the maintenance of soil fertility, greater recourse is now being made to the use of prawn dust, fish refuse and nightsoil. Only as a last resort does the average Malacca cultivator take to artificials like sulphate of ammonia.

No concentrates are fed to the buffaloes nor is fodder specially grown for them; in practice it is found that sufficient feeding can be derived from neighbouring fallows or, when the padi has been planted, from the edges of irrigation channels and drains. Care is taken to ensure that the buffaloes are bedded down with dry padi straw, and a night feed of approximately 40 lbs. of cut grass per animal is always provided. The resultant manure is collected as and when required. Tapioca refuse, sweet potato vines and water hyacinth (*Eichornea* spp.), dried fish, imported bran, and locally produced coconut cake make up the ingredients of the rations fed to the very few remaining pigs. The fowls and ducks are left entirely to forage for themselves except that the former are given the table and kitchen scraps and the latter occasionally a few small fish.

Scheduled planting dates for the main padi crop are strictly adhered to but, instead of planting a long or medium-termed strain, a short one such as Radin Siak or Padi Wangi, the latter an introduction from the Netherlands East Indies, is favoured. In the normal course of events in Malacca such a practice would invite trouble at harvest from pests with a grave risk of loss of the entire crop but Chinese industry successfully

PLATE I.
Typical high land site showing houses and coconut trees.

PLATE II.
Method of drying padi straw.

PLATE III.
Types of tools used.

PLATE IV.
Method of using scraper.

surmounts this obstacle. Adults as well as children spend all their spare time in pest control during this fortunately short, but vulnerable stage when the padi is in full ear. Harvest commences at the end of December, a period when favourable weather may be expected. One very noticeable feature of Chinese grown padi crops is evenness of ripening, revealing an appreciation of the benefits of seed selection. Once the crop is ripe, reaping is completed with all possible speed and preparations immediately made for the start of fallow season cultivation.

The standing padi crop is cut with a light sickle close to the ground and after threshing by the usual "*banting*"† method, the straw is carefully stacked in sheaves on ricks to dry. (Plate II). Then follows what is best described as the "skimming" of the surface of the *sawah* to remove the stubble and weeds. The operation is performed with a sharp changkol used after the fashion of an adze and the stubbles are left lying loose with only a minimum amount of earth adhering to the roots. After sun-drying for an hour or two they are then piled in semi-spherical heaps measuring 4 ft. high with a base diameter of 6 ft. and spaced approximately 20 x 20 ft. in the padi field. One man will take roughly 3 days to skim 1 acre and heap the stubbles. The heaps are then set to burn slowly. For complete incineration an optimum burn lasts 3 to 4 days by which time a very much reduced pile of friable burnt earth remains.

During incineration all available land between the heaps is ploughed to a depth of 6 ins. and subsequently made up by hand labour into beds, measuring roughly 4 ft. at the base, and 2½ ft. on the top. Their length is determined by the size of the padi plot and the final height from experience of the frequency and depth of flooding which can be expected. In a normal working day which extends from dawn to noon and from 4 p.m. to dusk, one man will make up 3 chains of beds. It is a common practice amongst the bigger holding owners, especially if time is at a premium, to hire casual labour for the rough work, the owner himself attending to the more skilled jobs. Rates for such hired labour during the 1946-47 season varied from $3 per day for a Malay or Indian to $4, plus a substantial midday meal, for Chinese.

In passing, it may be mentioned that these Chinese cultivators are painstaking farmers; their livestock are always well looked after and the buffalo is no exception. Time and care are spent on its welfare; its normal working day ceases at 10.30 a.m., not at noon as for human labour, and the owners are repaid by the possession of a huge, well developed, muscular, animal capable of intensive and sustained hard work. A noticeable feature of the Chinese-owned buffaloes is their relatively fast rate of working when contrasted with those belonging to Malay owners.

For ploughing, the normal Malacca plough is used but the hand tools favoured for making up the bunds (Plate III and IV) are obviously

† beating the sheaves of padi on to a sloping corrugated board standing within a large wooden tub.

introductions from China. Both the 4-pronged Assam fork with flat tynes and the wooden scrapers combine lightness and strength for ease of handling and efficiency for the purpose required.

To children is usually assigned the work of scooping out planting holes at the correct spacing and of filling them with burnt earth from a nearby heap. The use of this burnt earth provides both an excellent germinating medium for seeds (beans and cucumbers, etc.) and a first class rooting medium for seedlings (tomato) or rhizome cuttings (ginger, turmeric). Once sowing or transplanting is completed, dry padi straw from a conveniently situated rick is applied as a heavy mulch to the tops and sides of the bunds thus revealing once again the soundness of Chinese agricultural husbandry methods. (Plate V). Frequent and regular top dressings of liquid manure (pig, prawn dust, fish refuse or nightsoil) are applied to the growing crops, some of which come to bearing within 6 weeks of sowing. When crops are in full bearing the produce is collected and packed in large wicker baskets which are carried to the nearest collecting centre (Plate VI). It is a common sight, particularly during the peak months of April and May, to see rows of these packed baskets by the road sides awaiting collection early in the mornings.

With two exceptions the crops most favoured by the cultivators are short-termed, and comprise beans, cucumbers, tomatoes, chillies, celery, lettuce, mustards, and sweet potatoes. The two exceptions are turmeric and ginger which are harvested at 6 months though normally considered to be 9 months crops. The fullest use is made of all available ground, and wherever a relatively late maturing crop like turmeric or ginger is planted, a catchcrop of beans or cucumbers is always taken from the same bed.

The difficulties of assessing yields from so many individual and scattered holdings need not be elaborated, but conservative estimates rate the peak month's exportable surplus at 5,000 to 6,000 pikuls per month.

This almost unknown yet very appreciable contribution to the country's efforts at self-sufficiency is deserving of the highest encouragement. The difficulties are many, not the least being: (a) the vagaries of the weather, frequently resulting in the loss of crops by flooding, (b) continual exploitation by middlemen, and (c) unfavourable terms of land tenure. Notwithstanding, Chinese industry continues to overcome all obstacles and the acreage under fallow season cultivation is continuing to increase from year to year.

PLATE V.
Mulching.

PLATE VI.
Vegetable produce packed and being taken to collecting centre.

CULTIVATION OF TAIWAN PADI IN PERAK DURING THE JAPANESE OCCUPATION

BY

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Introduction.

When the British Army withdrew from Perak in December, 1941, huge stocks of rice, limed rice and padi which had previously been stored up in case of emergency were left behind, and in the early months of the Japanese occupation these stocks were freely rationed out to the people. Before the expiry of a full year of Japanese occupation, the authorities began to realise that an acute food shortage was imminent. They also realised that the padi fields of Malaya could supply only 34 per cent. of the needs of the country in an average year with a normally good crop, (*Malayan Agricultural Journal*, November 1940), and the tendency of the cultivators to hoard padi made the situation worse.

The First Planting, March to September, 1943.

It was in early 1943 that the Japanese began to search for a solution to the problem of a severe food shortage and the services of a Professor Goto, who claimed to have attended an Agricultural Conference held in Batavia before the war and to be an authority on Taiwan padi, were sought. The Taiwan Takushoku Kabushiki Kaisha (Taiwan Agricultural Development Co., Ltd.), which controlled agricultural pursuits in Formosa, opened an office in Ipoh in February, 1943, with Professor Goto and S. Abe in charge. About this time, technical personnel and padi seed in quantity from Taiwan arrived in Malaya, and Sungei Manik Stage I consisting of about 4,000 acres was chosen as the site for the first large scale experimental planting of Taiwan padi. This company was given full charge of the cultivation of padi in the State.

The first batch of Agricultural Assistants, comprising ex-students of the School of Agriculture, Malaya, ex-Asiatic Rubber Instructors and a few locally recruited boys with no previous agricultural training, numbering twenty in all, was recruited in February, 1943, and designated Padi Instructors. There was no dearth of local recruits, for all preferred this type of work to banishment to Siam. Before assumption of duties the Padi Instructors underwent a two months' practical course in Taiwan padi planting at the Sungei Manik Padi Test Station.

Work of clearing the padi fields in Stage I under the direct supervision of the recently appointed Padi Instructors began in March, 1943, immediately following the harvest of the main crop, the latter being chiefly Seraup strains. In order to obtain full co-operation, threats and beatings

were common from the nine Taiwan personnel in charge. The transition from local to Taiwan strains was immediate in Stage I and was enforced by the threat of dire penalties if local strains were substituted. Everything had to be done according to Japanese methods which were foreign to the cultivators. Planting was to be completed in April and harvesting in July so that the land would be ready for a second planting that same year. The abrupt change in planting technique, however, caused unavoidable delay in every operation (described later), and it was only in September that the harvest was completed. The second planting had to be abandoned.

To an unbiased observer the first planting of the crop could not be said to be a failure, nor was it a success. There were areas where good crops of 300 to 400 gantangs per acre were harvested and there were others where not a single grain was reaped. The successful cultivators were those who accurately followed the prescribed methods of planting while those of a less painstaking turn of mind or who were unfortunate enough to suffer from poor water control or excessive pest damage failed to reap even a moderate crop for their labour.

The Japanese, however, considered the experiment an unprecedented success and the widest publicity was given to it in the press and by the travelling propaganda van. Their " success " in this experiment was celebrated in considerable style. Samples of the rice milled from this padi were despatched to the Governor, the Commander-in-Chief of the Japanese Army, and high ranking officials.

The Second Planting, February to August, 1944.

Following the partial success of this experiment at Sungei Manik, the Taiwan Co. extended its operations to the Krian District.

The most fertile area in the Krian District, which embraces all the Class I land totalling about 20,000 acres, was chosen for planting. The same methods as practised at Sungei Manik were adopted but the crop failed because of: (a) the great depth of the alluvial soil, and (b) the difficulties of drainage, since Taiwan padi cannot stand any depth of water over 6 to 8 ins. Only 700 piculs of Taiwan padi were harvested from this selected area of 20,000 acres, an average of less than 1 gantang per acre as compared with an average of 300 gantangs per acre of the local Seraup padi.

It was only after this failure that the idea of forcing the kampong people to plant Taiwan padi was abandoned and permission given to plant their own strains from 1944 onwards.

Cultivation Methods.

The cultivation of Taiwan padi conforms to the technique of padi cultivation employed by cultivators in China, Japan and Formosa. In these countries it is not the practice to leave *sawah* land fallow as in Malaya and thus the necessity of first of all having to *tajak* the rank growth of grasses is eliminated.

Immediately following the preparation of the nurseries, the land was changkolled, water was let into the *sawah*, and the land harrowed once or at most twice in readiness for transplanting which took place 15 to 20 days after sowing. Female labour was employed throughout transplanting. Seedlings were planted at intervals of 8 to 10 ins. between hills, each of which contained 3 to 4 seedlings. This close spacing accounted for the comparatively high seed rate per acre of 5 to 6 gantangs.

After planting, two weedings were generally necessary at intervals of one month. The weeder knelt between the rows and buried any weeds into the mud with his hands. No tools were ever used for this work.

Harvesting commenced in 90 to 100 days from transplanting. The padi was cut with a sickle and threshed into threshing tongs.

Observations on the Planting of Taiwan Padi in Perak.

It was found, generally, that Taiwan padi seedlings should not be retained in the nurseries longer than 20 days. Beyond that age tillering and flowering in the nursery could be expected.

After planting, a depth of 4 to 5 ins. of standing water was essential for proper tillering and fruiting of the plants. Water in excess of this tended to stop tillering and resulted in irregular flowering. In extreme cases, i.e., 10 ins. or more of water, flowering was mostly prohibited and death of the plants soon resulted.

Shallow fertile soil appeared to be necessary for, and deep alluvial soil detrimental to, successful cropping. Peaty soil would not support a robust growth of Taiwan padi.

The Taiwan padi plant was very soft and exceedingly susceptible to pests, diseases and lodging. It was found that in the taller varieties lodging was very common. In almost all cases the seedlings in the nurseries were invariably attacked by *Scotinophara* spp. The soft stems of the plants attracted all varieties of stem borers in the initial stages of growth, and later, particularly at the stage known as " Bunting kechil ", were very attractive to rats.

During the Japanese occupation an unknown leaf spotting disease was noticed which was identified after the re-occupation as Padi Blast, *Piricularia oryzae*. It was first noticed by the writer at Selinsing Padi Test Station in 1944.

Types of Taiwan Padi.

In the Krian and Lower Perak Districts the following varieties of Taiwan padi were introduced and planted.

(a) Zairaishu (Pure Strains).

1. Ryushu. This is a very short padi attaining a height of about 2 ft. when mature. A characteristic feature is the wide angle insertion of the leaf blade which is short with a very sharp abrupt tip. When young the plants are dark green but as they mature they turn yellow as though suffering from a shortage of chemical plant food. This also is a characteristic

feature of the variety. This variety is considered to be one of the hardiest; by virtue of its short straw, lodging is minimised and its capacity for tillering is superior to all others. Up to 25 tillers per plant have been noticed when the variety was growing under favourable conditions. The padi grains are of a uniform, dark brownish colour and to the touch the glumes are very rough.

Ryushu grain is medium sized, fairly broad, light brown in colour and the rice is hard and consequently mills well. When highly-milled it has an 'off-white' colour.

Under optimum conditions a yield of approximately 400 gantangs per acre may be expected in the field.

2. Peipihun. This is the tallest of the varieties introduced into Perak, averaging at maturity a height of 3½ to 4 ft. It suffers from the disadvantage of being weak-strawed and consequently lodging is troublesome. Its tillering capacity is poor, averaging 4 to 5 tillers per plant.

The grain resembles local Radin types in colour and appearance. The texture of the rice is soft, and the ease with which it can be ground into flour (hence the Japanese name) is characteristic.

Under normal field conditions a yield of only 200 gantangs per acre may be expected.

3. Gosisai. This is the only awned variety amongst the introductions. It is of medium height, of poor tillering capacity, but fairly strong-strawed. The grain resembles 'Rangoon' types. Poor yields were always obtained, approximating only 200 gantangs per acre.

4. Tai-Riuban.

(b) Horaishu (Hybrid).

1. Kanan 2. In appearance this variety looks like Peipihun from a distance but on closer examination the leaves and stalks are seen to be stouter and much greener in colour. Tillering capacity is poor, numbering 4 to 5 tillers per plant.

The grain is short and roundish like that of " Rangoon " padi. The rice when milled has a shining appearance. When cooked it is very glutinous but possesses a pleasant flavour. It is very hard to thresh. This is quite an old established strain and is said to be bred from a cross between the Taiwan local and a Japanese strain.

A yield of 200 to 250 gantangs per acre may be expected under normal field conditions.

2. Taichu 65. This strain has the same characteristics as Kanan 2 except for its slightly paler colour. It is therefore difficult to distinguish between the two.

3. Taichu 176. This is almost the same as Taichu 65.

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THE MANUFACTURE OF TEA

BY

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After the introduction of tea drinking from China into Europe in the 17th century, the cultivation and manufacture of tea extended in time to India and Ceylon, and to other warm climates. The ancient methods of hand manufacture were followed, with eventual substitution of imitative machinery, but except in degree of fermentation and modification of flavour, the process has changed little, the rolling and twisting of leaf and separation into grades keeping to traditional lines.

Between the widely separated producers and consumers, the tea trade became a powerful influence with its organisation for buying, appraising, tasting, and blending, together with vast accumulated experience; not unnaturally it has clung to tradition, and has not encouraged departure from accepted standards.

In more recent times research has entered into tea manufacture as into many other fields, and though at first concerned with many immediate and urgent problems, has eventually not refrained from questioning the whole structure of the industry. An account of this development was given by the Biochemist of the Tea Research Institute of Ceylon, in the annual reports of the Institute for 1944 and 1945, and in the *Tea Quarterly*. This account states that the work of the research organisation was initially of analytical character leading to improvement in detail, with marked success in the realm of systematisation, organisation and control, all without any great enthusiasm on the part of the industry for changes. In fact, the driving force behind the changes accomplished was the last economic slump; with the war-time security in disposal of crop there were signs of manufacture relapsing into haphazard methods. Persons of vision in the industry have not failed to appreciate that the use of machinery for tea making is in a sadly undeveloped state, and in spite of new ideas which abound in the use of machinery in general, the main ambition in the tea industry has been to improve the efficiency of customary types of machinery. The clinging to the present tea rollers, which are but a mechanical means of performing the ancient handrolling, is due to the traditional demand for the twisting of tea leaf and its resulting appearance, which demand resists any movement to break away from it. Yet in reality, the twisting is only one way, and an inefficient way at that, of extracting juice for fermentation and production of liquors which constitute the beverage.

The tea trade, as distinct from the consumer, has placed an entirely fictitious value upon the appearance of the black leaf, which does not on the whole concern the consumer. The consumer is essentially interested

in a beverage, and relatively few care about appearance of the leaf or method of manufacture, so long as the liquors are not adversely affected and a brew that appeals to the palate is obtained.

Before 1936 the Research Institute was not in a strong position to challenge tradition, as the nature and effects of the factors chiefly influencing each process were very imperfectly known, but after that date, research into the processes of fermentation, as well as rolling and fixing, gave an insight which made it possible to consider radical changes in manufacture, which would have as their main object a simplification of the process and a reduction in the time and labour required.

At first the rolling process only was modified, and withered leaf instead of being rolled in conventional machines was put through a "Clivemeare roller", which uses two smooth steel rollers revolving at unequal speeds. This method gave a tea quite unlike the traditional type in appearance, but producing very satisfactory infusions. But further, it was obvious that withering was one of the most expensive and inconvenient factors of the whole process, demanding excessive space, and much handling and loss of time, as well as involving a big fire risk. Investigations showed that in all probability the only purpose served by withering was to bring the leaf into suitable physical condition for treatment in the conventional machines. Therefore it was decided to eliminate withering, and use a very simple method of manufacture. The fresh leaf direct from the field is reduced to pulp by the "Clivemeare roller." The resulting pulp ferments very rapidly and may be fired in under two hours after arrival as leaf from the field. The product is a brown flaky leaf, adapted for compression into blocks for shipment. This simplest basic process is capable of elaboration in many ways so that tea of more conventional appearance can be turned out.

It unfortunately happened that these innovations received premature and misguided press publicity, and journalistic enterprise succeeded in making exaggerated accounts of the so-called "Tablet Tea" even before the tea tasters had heard of the new process. The tea trade was antagonised by this type of unwanted publicity, quite apart from the merits or demerits of the actual teas. The liquors of these new process teas at first had a somewhat metallic character, but it was proved that this fault had nothing to do with absence of withering, but actually was due to a residuum of unfermented juice and was eliminated by improving the aeration of the fermenting mass.

The most promising immediate outlet for the new process teas appeared to be amongst the blenders, but so long as other tea dealers demand orthodox leaf standards a complete change of method is not feasible. However, research has not been confined to this radical break with tradition, but has been applied to the betterment of withering and rolling as employed to produce the orthodox leaf.

As said before, withering is inconvenient and expensive and attempts

have been made to improve it without abolishing it. The object of withering is to reduce moisture content and bring the leaf into proper physical condition for rolling, but several mechanical driers have been introduced and have proved failures in Ceylon. Living leaf has a natural resistance to withering which may be overcome by heating or by freezing. Full investigation of the second method has been retarded by difficulty in obtaining refrigerating plant. The objection to the first method is that heat also kills the enzyme which is required later to cause fermentation, but it was found that short blasts of hot air " kill " the leaf without too much destruction of enzyme. This achieved, a reasonable wither is effected by 20 minutes in a drier at about 100°F. The importance of rapid removal of surface moisture from the leaf to be withered is emphasised, as bacteria multiply on wet leaf and there is evidence that over-fermentation, with consequent dull liquors, is largely due to bacterial action. In the absence of heavy bacterial contamination, true enzymic fermentation is not regarded as particularly harmful when prolonged beyond the normal time.

Rolling as normally practised is also slow and cumbrous, and a close study was made of its action and effects. It was found that pressure applied by means of the pressure cap impedes circulation of the leaf in the jacket, and so defeats its own object, as twisting of the leaf depends entirely on circulation. In studying the function of many available types of battens it was discovered that the greater part of the rolling occurs at the centre part of the table, and that beyond that the battens are virtually ineffective. The shape of the fitting at the centre of the table is of great importance, as tearing and cutting as well as rolling come into effect. Investigations therefore took the form of using a plain table and adding different types of fitting at the centre. Also certain commercial firms developed machinery working on the principle of " cone rolling ", or " column rolling." The research showed that any projection on the table increased circulation of the leaf and any device with sharp edges had a pronounced cutting effect. As the jacket rotates, a squeezing action is applied to the leaf which comes between the projection and jacket and is far more effective than pressure applied by a pressure cap which may therefore be rejected. An unsymmetrical projection accentuates the squeezing, but the irregular resistance generated creates severe mechanical difficulties, and therefore the projection has to be symmetrical and central. The pressure then is applied in an epicycle, which has given rise to the name " epicyclic pressure rolling " for all devices employing the principle. The dimensions and shape of the central fitting have a far-reaching effect on the degree of breaking and the appearance of the leaf and its design is a matter of fine adjustment. With a successful design the economic advantages of E.P. rolling are considerable; tea of quality equal to that from ordinary rollers may be produced by three 20 minute rolls against the normal four periods of ½ hour each. The elimination of the pressure cap facilitates charging and saves labour. The roller jacket may be lowered so close to the table that there is no " throw out "

to be dealt with. The power consumption is initially rather high, but it falls rapidly, and in all is by no means proportional to the increased output of the roller.

Such, briefly, are the developments arising from investigation of the fundamentals of rolling, but it is emphasised that although E.P. rolling will eventually replace the use of battens, over-hasty conversion without careful design is liable to be disastrous. Further conclusions are that piecemeal conversion is unsatisfactory in its interference with proper planning of a rolling programme, and that separate rollers are desirable for first and last rolls to fulfill the different functions of twisting and cutting.

It will be gathered from the foregoing abstracts that tea research is pressing for fundamental changes in tea manufacture, which, while subject to restraint owing to conservatism in the trade and some indefinite body of consumers, have the driving force of economics behind them. It can hardly be disputed that it is as a beverage that tea must be finally judged, and amongst manufacturing processes which can satisfy the majority of consumers in that respect those that will survive will be the most economic.

A DEMONSTRATION OF MECHANICAL CULTIVATION AT THE CENTRAL EXPERIMENT STATION, SERDANG

BY

C. W. S. HARTLEY,

Agricultural Officer-in-Charge, Central Experiment Station, Serdang.

For some months past the Department of Agriculture has been importing for experimental purposes a range of tractors and implements of types likely to be suitable for use in this country. While efforts will be directed chiefly to an attempt to discover methods of mechanising wet padi cultivation, the Department has not lost sight of the possibilities of mechanised cultivation and the use of mechanical equipment in areas planted with or being opened for the major dry land crops of the country. With the rapid development of the production and use of mechanical equipment during the last decade it is thought that much progress might be made in this direction, and indeed many of the larger planting companies are already making use of mechanically drawn implements.

Investigations into the use of mechanical implements and into the effect of their use on the crops under cultivation take time and several years must elapse before the results of experiments can be made known. It was, however, thought desirable, even at the early stage, to give to the general public an opportunity of seeing some of the tractors and implements at work in order that they might get an idea of what types were available and which were likely to prove manageable and suitable for their particular circumstances. For this reason a demonstration of mechanical equipment was arranged at the Central Experiment Station, Serdang, on 28th January, 1948.

The weather both prior to and on the day was very favourable for cultivation, and all implements were shown to best advantage. About 340 persons of all nationalities attended the demonstration, the majority being planters many of whom had come from as far away as Kedah and Johore. Every visitor was given a set of notes on the demonstrations showing the name of the implement, manufacturers, approximate price, and estimated rate of work and cost of each operation. The demonstrations given are listed in Table I.

The Demonstrations.

The first six demonstrations showed small two-wheeled tractors at work. The first of these, the 'Gem' Rotary Hoe, was shown cultivating a piece of former grass land and also as a cultivator for inter-row weeding

TABLE I.

LIST OF MECHANICAL CULTIVATION DEMONSTRATIONS, CENTRAL EXPERIMENT STATION, SERDANG, 28th JANUARY, 1948.

No.	Tractor	Horse Power	Implements	Operations Demonstrated
1.	Howard's "Gem" Rotary Hoe ..	6.5	..	(1) Cultivation on grass land. (2) Inter-row cultivation of fodder grasses.
2.	Montgomery Ward "Plowtrac" Tractor* ..	3.2	Disc-harrow ..	Disc-harrowing on ploughed land.
3.	B.M.B. "Cult-Mate" Tractor* ..	3	Disc-harrow ..	-do-
4.	B.M.B. "Plow-Mate" Tractor* ..	6	Plough ..	Ploughing on grass land.
5.	Anzani "Iron Horse" Tractor* ..	6	Disc-harrow ..	Disc-harrowing on ploughed land.
6.	"Trusty" Tractor* ..	6	Plough ..	Ploughing on grass land.
7.	Fordson "Major" Tractor ..	21.5	Light disc-harrows ..	Inter-row cultivation of oil palms.
8.	Allis Chalmers "HD.10" Tractors	65	— ..	Felling of oil palms.
9.	Caterpillar "D.8" Tractor ..	85	Bulldozer ..	-do-
10.	Caterpillar "D.4" Tractor ..	27	Bulldozer and heavy disc-harrows ..	Inter-row cultivation of oil palms (in *belukar*).
11.	Caterpillar "D.4" Tractor ..	27	Bulldozer and cut-away disc-harrows ..	-do-
12.	Fordson "Major" Tractor ..	21.5	"Fishleigh" rotary cultivator	Preparation of seed-bed.
13.	Caterpillar "D.4" Tractor ..	27	Bulldozer and 3-furrow disc-plough ..	Ploughing in *belukar*.
14.	Caterpillar "D.4" Tractor ..	27	Heavy disc-harrows ..	Cultivation after ploughing in *belukar*.
15.	Caterpillar "D.4" Tractor ..	27	Single-furrow mould-board plough "Prairie Buster" ..	Ploughing.
16.	Caterpillar "D.4" Tractor ..	27	2-furrow mould-board plough	-do-
17.	Fordson "Major" Tractor ..	21.5	4-furrow disc-plough ..	-do-
18.	Fordson "Major" Tractor ..	21.5	Light disc-harrows ..	Preparation of seed-bed.
19.	Fordson "Major" Tractor ..	21.5	Combined disc-drill and manure distributor ..	Drilling of cover crops.
20.	Fordson "Major" Tractor ..	21.5	Danuser Digger ..	Digging planting holes.
21.	Farmall "A" Tractor ..	15	2-furrow disc-plough ..	Ploughing.

* These tractors are supplied with ploughs, harrows, hoes, cultivators and in some cases with drills.

PLATE I.
Felling oil palms with 2 HD 10's dragging a 1 in. cable.

PLATE II.
An oil palm falling.

PLATE III.
A single row of oil palms felled by cable.

PLATE IV.
Land ploughed by the B.M.B. 6 h.p. "Plowmate."

of fodder grasses. The remaining small tractors were all supplied with ploughs, disc-harrows and a variety of cultivators. The smallest of these, the Montgomery Ward 'Plowtrac', an American machine, was shown disc-harrowing a previously ploughed area. The B.M.B. 'Plow-Mate' and the 'Trusty' tractor, both of 6 h.p., were ploughing a piece of grass land, while the Anzani 'Iron Horse' (6 h.p.) and the B.M.B. 'Cult-Mate' (3 h.p.) were shown cultivating with their disc-harrows. (Plate IV). These four machines are of British manufacture.

The second group of demonstrations showed two methods of felling oil palms, the first by a 1 in. cable drawn by two HD.10 Allis Chalmers tractors and the second by means of a D.8 Caterpillar tractor and bulldozer. The latter method had the advantage of lifting the palm stump right out of the ground, but the former method was quicker in operation. In this method (Plates I, II, and III) the 2 HD.10's travelled on either side of a row of palms dragging the cable behind them. Each palm was pulled down in turn, the cable riding up over the crown of a palm when it had fallen and automatically coming into position, about 4 ft. above ground level, for pulling down the next palm. In this way the palms were felled in a neat straight line. Some of the palms were felled by this method two rows at a time, but in this case the palms fell inwards and the work was much less neat, several palms being incompletely felled.

In nearby fields were demonstrations of inter-cultivation of oil palms and of ploughing and disc-harrowing in *belukar*. Perhaps the most striking of these was a D.4 Caterpillar tractor with a heavy disc-harrow dealing with 6 ft. *belukar* of mixed *kedudok* and *resam* fern between oil palm rows. (Plates VI and VII). Areas disced 3 weeks before appeared to be almost clear of growing vegetation but were covered with a carpet-like mulch of dead *resam*. Another demonstration which caused much interest showed the turning over of similar *belukar* (but outside the oil palm areas) with a strong 3-furrow disc-plough. In an oil palm area with lighter vegetation a Fordson with a light disc-harrow was being used for inter-cultivation. This effected less cultivation of the soil than the heavy discs but was very effective in reducing the high vegetation between the palms and might be considered as an alternative to hand-slashing. (Plate V).

Little comment or explanation is required for the last group of demonstrations (Nos. 12 and 15 to 21) which were all carried out on a piece of prepared land previously under grass. They consisted for the most part of demonstrations of different types of ploughs, harrows and drills pulled by Caterpillar, Fordson and Farmall tractors. As to the ploughs it was clear that the disc type had the advantage where vegetation was heavier but that a deeper furrow and a more complete turn-over was obtained with the mould-board ploughs. The 2-furrow disc-plough with the Farmall 'A' was of particular interest as being the only direct-attached cultivation implement on view. It was unfortunate, however, that there was no integral plough operated by power lift available for demonstration. An item of

particular interest to planters was the Danuser Digger for digging planting holes. Unfortunately only a 9 ins. augur was available but an 18 ins. augur is manufactured. (Plate VIII).

Comments.

Many of the demonstrations caused considerable discussion among the visitors and it was interesting to hear the variety of opinions expressed. Generally speaking more interest was shown in the cultivation demonstrations by visitors with oil palm and coconut interests than those with rubber interests. Among the former some preferred the use of disc-ploughs to light harrows for inter-row work, on the grounds that the heavier implement would give greater cultivation in addition to the crushing and cutting effect of the harrows.

The felling demonstrations aroused great interest, but opinions were divided as to the best method of use. Some visitors pointed to the more complete eradication of the trees by the D.8 and bulldozer, but others preferred the neat work of the HD.10's and cable. All were agreed that the high capital cost of the equipment precluded its use except by large groups of estates or by contractors.

Many visitors considered that the methods of dealing with *belukar* both by disc-plough and disc-harrow were impressive and would be useful in the rehabilitation of areas, whether planted or not, which had reverted to this type of scrub. It is worth mentioning here the danger of light disc-harrowing in light scrub if there is any lalang present under the taller plants. The removal of the latter by disc-harrowing gives the lalang a chance to re-establish itself and spread.

Most planters considered that the smaller implements would have little application for general estate work but that when any extensive nursery work was undertaken they would be most useful.

In the ploughing demonstrations the eradication of lalang was uppermost in most visitors' minds. Unfortunately, though there is little doubt that these implements can be most usefully employed in this work, the Department's experiments have not yet reached a stage where definite recommendations can be made.

The Danuser Digger aroused much interest and, provided that the 18 ins. augur proves as promising as the 9 ins. one, most visitors considered that planting costs could be much reduced by its use.

Attention was drawn to the fact that the demonstrations were carried out on flat land whereas much of the agricultural land in this country is undulating or hilly. It is clear that on very hilly land the operations could not have been carried out, though the majority could have been undertaken on gently undulating land.

The Demonstrators.

An Officer of the Department was present at each group of demonstrations to answer questions and supervise the work done. Most of the

PLATE V.
Disc-harrowing with Fordson Tractor in light undergrowth in an old oil palm area (first cut).

PLATE VI.
Heavy disc-harrow with Caterpillar D.4 with bulldozer set 6 ins. above ground working in thick *belukar* in an old oil palm area.

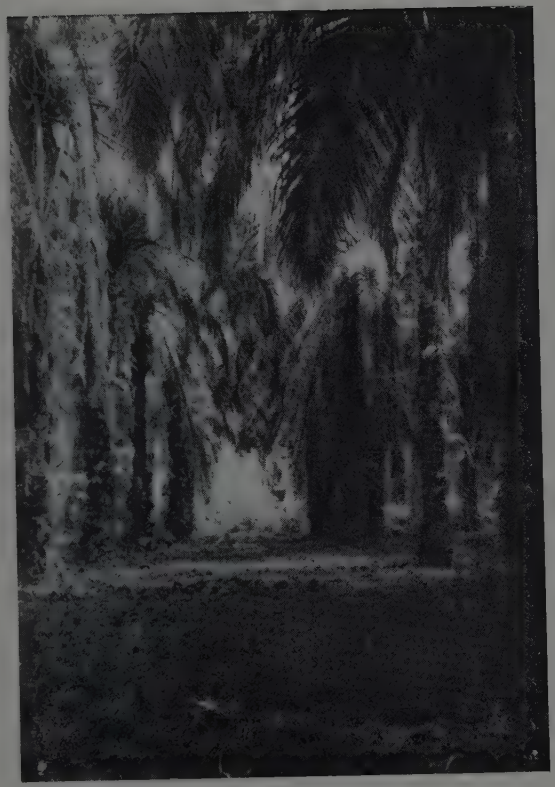

PLATE VII.
The old oil palm area of Plate VI after three heavy discings.

PLATE VIII.
The Danuser 9 ins. Digger attached to a Fordson.

preparatory field work was done by the Agricultural Engineer and Instructor attached to the Mechanical Pool at the Central Experiment Station and by other members of the Station Staff, while suggestions for and help with the preparation of the programme came from the Agricultural Officer, Food Production, Mr. E. J. H. Berwick, who was the first to suggest that these demonstrations should be given. Assistance was also obtained from the Staff of the State Agricultural Officer, Selangor, at Sungei Buloh.

The operators of the tractors were all locally recruited staff attached to the Central Experiment Station and Mechanical Pool, and Sungei Buloh.

AN EARLY REFERENCE TO POSSIBLE BIOLOGICAL CONTROL OF A COCONUT PEST (*Levuana iridescens* B-B.)

BY

R. J. A. W. LEVER,

Entomologist.

The biological control of the purple coconut moth of Fiji, *Levuana iridescens* Bethune-Baker, stands after twenty years as one of the most successful examples of the virtual eradication of a tropical insect pest by another insect. The predaceous beneficial insect in this case was a Tachinid fly, *Ptychomyia remota* Ald., which was taken by sea from Malaya to Fiji in 1925 by Dr. T. H. C. Taylor and Mr. H. W. Simmonds, O.B.E.

In the lavishly produced book "The Coconut Moth in Fiji" by Dr. J. D. Tothill, Mr. (now Dr.) T. H. C. Taylor and Mr. R. W. Paine there is a fairly detailed historical account of work previous to 1925 on *Levuana*, and the reason for this article is to give an apparently unpublished record of even earlier information on the possible biological control of this moth. The source of this note is a file in the records of the Division of Entomology.

Early in February 1914, the then Government Entomologist, Fiji, (Mr. F. P. Jepson) initiated correspondence with his colleague in Malaya (Mr. H. C. Pratt), the latter mentioning that Mr. I. H. Burkill of Singapore had a fungus (*Botrytis necans*) which he had used in the field to "wipe out" the Malayan moth *Artona catoxantha* Hamps. which is closely related to the Fijian *Levuana*. Although the culture, sent by Pratt to Fiji in July, 1914, failed to control the *Levuana* caterpillars in the coconut palms it is interesting to place on record this early if unsuccessful attempt to check a moth by its fungus parasite, especially as it was a fly parasitic on the caterpillars of the same Malayan *Artona* which over twenty years later finally gave complete control of *Levuana* in Fiji.

Selected Articles.

WAR ON WEEDS

Herbicides are divided into the following groups:—

(1) Soil sterilants such as sodium arsenite, ammonium thiocyanate, borax or borate ores, carbon bisulphide, chloropicrin and sodium chloride. For killing deep-rooted perennials, 250 lb. of sodium chloride + 15 to 30 lb. of borax + 3 to 4 lb. of sodium arsenate per square rod are required.

(2) Non-selective contact sprays such as oil, acid and salt derivatives that kill all vegetation above ground. Many contain sodium arsenite alone or combined with sodium chlorate. This is poisonous to livestock and is a fire hazard.

Newer herbicides include (3) selective sprays like sulphuric acid, oils and Sinox which wilt most broad-leaved weeds but leave grains, flax and grasses unaffected. One gallon of sulphuric acid in 50 gallons of water sprays ½ acre and kills most weeds rapidly. Sinox, a coal-tar derivative, is used as a spray from aeroplanes. One gallon of Sinox in 120 gallons of water applied at the rate of 80 to 100 gallons per acre killed only broad-leaved annuals and had little effect on grasses. Flax and peas should not be sprayed with it before reaching 3 ins. height and never after bud formation. Alfalfa and red clover developed high resistance to it when 4 to 6 weeks old. Light-weight oils applied full strength are used for weeding carrots when the crop is less than 3 ins. tall. Members of *Umbelliferae* are tolerant to oil sprays.

(4) Poisons like arsenic trioxide, arsenic trichloride, sodium chlorate, ammonium sulphamate; ¾ lb. of ammonium sulphamate in a gallon of water applied at the rate of 1 to 3 gallons per 100 sq. ft. is more suitable than sodium chlorate. It does not leave the soil sterile for more than a short time and it contains fixed nitrogen which enriches the soil.

(5) The Sizz-weeder produces a hot-air blast which is applied when the cultivated crop has a greater fibre content than the weeds. It destroys the weeds, and leaves the crop unharmed.

(6) Hormones such as those known as 2, 4-D and 2, 4, 5-T stimulate abnormal growth which kills the plants. Small doses such as ¼ to ½ oz. per sq. yd. are effective. They may be applied in water sprays or incorporated into dust or aerosols. They attack most broad-leaved plants and are most effective on young plants. Plants are killed after about 1 month. Hermone application should be made within four hours of rain; it is most effective on plants growing in moist soil and is more rapid in sun than in shade.

(7) Machines for moving and crushing plants, and soil covers to suffocate weed growth.

Soils and Fertilizers, 9, 212, 1946.

USE OF 2, 4-DICHLORO-PHENOXYACETIC ACID AS A SELECTIVE HERBICIDE IN THE TROPICS

Trials were made in Puerto Rico with 2, 4-D converted into the more water-soluble ammonium salt by the addition of NH_4OH on an equimolecular basis. Major weeds in sugar cane and coffee plantations were killed, but neither cane nor coffee plants showed adverse effects with sprays up to 0.3 per cent. The effect of 2, 4-D is to kill the growing point in a few weeks. It is sprayed on the weeds, but some comes into contact with the soil and it was detectable in soil 3 to 5 weeks after application. Radish seeds germinated in cotton soaked in 2, 4-D, and others grown in soil sprayed with 2, 4-D showed reduced root and shoot growth. Mature weeds, grasses and some other plants were relatively insensitive to 2, 4-D.

Soils and Fertilizers, 9, 213, 1946.

NEW WEED-KILLING SPRAY IN HAWAII

The use of Diesel oil as a weed-killing spray has been well known, but as commonly used large volumes are required. By a process patented by the HSPA (U.S. Patent No. 2, 370, 349) the oil can be activated to such an extent that instead of 25 per cent. of Diesel oil in a common emulsion, only 2.8 per cent. of the new emulsion is needed for treating succulent weed growth. This emulsion in a concentrated and highly activated form has now been developed to the point where it can be prepared at a central plant and transported to the field, where one part of the concentrate may be diluted with 30 parts of water to make the finished spray. This is very convenient for irrigated plantations, where the water can be taken from a ditch instead of being hauled to the field; 250 gallons of concentrate are sufficient for a full day's operation of a gang using portable sprays. Where weeds and grasses have been growing for some time the dilution of the concentrate may be 1 to 24, and in special cases of very heavy and hardy grass growth the dilution may be lowered to 1 to 12. The fieldmen report that this system of weed control is superior to any other chemical herbicide that has been tried in the past. The cost of materials employed is actually less than for commonly used herbicides. This Diesel emulsion is non-poisonous and leaves no permanent residue in the soil; it is non-irritating to persons who handle, and is not unduly destructive when accidentally applied to sugar cane.

Sugar, 42, 52, 1947.

Reviews.

A Sampling Survey of Tapping on Small Holdings (1939-40).

By H. Fairfield Smith, B.Sc. (Agri.), (Edin.), M.S.A. (Cornell), F.S.S., Statistician, Rubber Research Institute of Malaya. Communication 265, Vol. 12, Journal of the Rubber Research Institute of Malaya. January 1948. 46 pp. Price 50 cents. (Straits Currency).

This Bulletin is a summary of the surviving data of a sample survey of rubber small-holdings in Malaya carried out in 1939-40 principally to obtain information on the variation in bark reserves. The war prevented publication of the results when the survey was completed, and some of the records were destroyed during the occupation. It is pointed out that much of the information is now out of date, but the principal object of the analysis of the available data is to provide information for the efficient planning of any future survey.

The survey was restricted to holdings of less than 25 acres, and the following information was obtained: (i) races of ownership of holdings, (ii) sizes of holdings, (iii) girths of trees, (iv) bark reserves, (v) maximum heights tapped, (vi) incidence of tapping, (vii) thickness of bark in tapping, (viii) heights of cuts in tapping, (ix) tapping systems, (x) density of stand, (xi) age of trees, and (xii) races of owners and tappers. Additional information was obtained on schedules, but these schedules were destroyed, and most of the data from them have therefore been lost.

The Bulletin contains considerable statistical analysis of the data available together with eleven tables summarising the results, and Mr. Fairfield Smith is to be congratulated on the amount of information he has been able to extract from the incomplete records.

Probably the most important information obtained refers to bark reserves on small-holdings. The formal definition of bark reserves, i.e., area below 60 ins. in height with bark thicker than 5 mm., was intended to indicate reserves available on methods of tapping customary on small-holdings. For reasons given, it is now considered that more important information would be what holdings could work below 40 ins. It is also pointed out that the survey failed to distinguish between immature but promising bark and bark which may never become better than 5 to 6 mm.; it also failed to distinguish between thin virgin and renewed bark. General indications from the data available were that bark reserves were satisfactory: 89 per cent. of the holdings were considered as mature, i.e., girth greater than 18 ins., and of this percentage the distribution of thin bark was as follows: 13 per cent. more than 10 circumference inches, 4.7 per cent. more than 15, and 1.7 per cent. more than 20. It is considered, however, that

the survey over-estimates available bark in that it includes bark on poor-yielding trees which holders may seldom or never tap.

The author pays a tribute to the work of Mr. R. H. Meikle, who was killed in action in January,1942. Mr. Meikle was the Small Holders' Advisory Officer of the Institute, and the field work in connexion with the survey was carried out by Rubber Instructors under his direction.

H. L. B.

Guide to the Botanic (Waterfall) Gardens, Penang.

by F. S. Banfield, Department of Agriculture, Federation of Malaya. 39 pp., 10 plates and plan. Price $1.

The Botanic Gardens, Penang, formerly formed part of the Gardens Department, Straits Settlements, under the control of Mr. R. E. Holttum, Director of Gardens, S.S. In 1946, in view of the changed political constitution of Malaya, the Penang Gardens were transferred to the care of the Department of Agriculture and came under the jurisdiction of the Director of Agriculture, Malayan Union.

Mr. F. S. Banfield, an officer of the Department of Agriculture, was placed in charge of the Gardens, and he has written the Guide under review. In an interesting historical foreword, Mr. Banfield traces the history of Botanic Gardens in the East, and shows how originally they were responsible for work on crops and plants subsequently taken over by Departments of Agriculture when established.

The present Botanic Gardens in Singapore were founded in 1858, and the Penang Gardens about 1887, though the Penang Gardens Department was established in 1884. In Malaya, until the establishment of the Department of Agriculture, F.M.S., in 1905, the Botanic Gardens Department of the Straits Settlements was largely responsible for the supply of technical advice and assistance in the cultivation of crops.

The Guide is very well produced and illustrated and includes a useful plan of the Gardens. It will be of interest not only to visitors to the Penang Gardens but to all interested in the flora of Malaya, as it provides a very comprehensive account of all the trees and plants to be found in the Gardens. An index of plant names is a valuable addition to the Guide.

H. L. B.

Birds of Malaysia.

by Jean Delacour.

Introduction to Malayan Birds.

by G. C. Madoc, M.B.O.U., Malayan Nature Journal, Vol. 11, Nos. 304, November, 1947.

The formation of the ' Greater East Asia Co-prosperity Sphere ', which caused the deaths of two of the foremost ornithologists in Malaysia, F. N. Chasen of Singapore during the evacuation, and M. Bartels of Java on the Siam-Burma railway, ironically resulted in the addition of two books to the few available on the birds of this region. The first of these, ' Birds of Malaysia ' is one of the Pacific World series which was designed for the information of American troops who were taking part in the liberation, while the second, ' An Introduction to Malayan Birds ', was written during internment in Changi Gaol, Singapore, not only to enlighten fellow-prisoners, but also, in the words of the author, ' to jot down many facts of which I no longer possess written record, and to crystallise and sift my knowledge.'

The former, which no one who is really interested in birds can afford to ignore, gives short descriptions and range of the seven hundred and eighty species occuring in the Malaysian sub-region, together with many valuable keys and black-and-white illustrations for their identification. The latter deals only with the area now known as the Federation of Malaya, and in it will be found detailed descriptions, nesting habits and range of ninety-four species and brief references to another one hundred and seventy-three forms. Most of the common birds may readily be identified with its aid and all who take a delight in the natural history of Malaya should keep it at hand.

E. J. H. B.

Journal of the Malayan Branch, Royal Asiatic Society.

Vol. XX, Part II (December 1947).

No English-speaking resident of Malaya who fails to subscribe to, or borrow regularly, this most readable Journal can claim an intelligent interest in the cultural heritage of the Peninsula. The high standard of papers submitted for publication has been well maintained in the second post-war number which appeared in December, 1947.

The general reader will turn first to a most interesting and well-documented account of the origin and development of the Malay Keris by G. C. Woolley. This author refutes the spear or sting-ray origin of the Keris which, admittedly, was never very convincing, nor can he find support for a foreign origin. Instead he shows that all evidence point to the weapon having a local, East Indian origin, with Java as its probable birth-place. Then follows a brief account of the different types of Keris which is well

illustrated with drawings by Inche Abu Bakar bin Pawanchee. It is perhaps pertinent to note that, in the majority of Keris met with today, the hilt is usually at a right angle, or nearly so, to the blade whereas in these illustrations it has been figured in the same plane. This is particularly noticeable in Plates VI and XV.

G. A. Gibson-Hill has contributed some very full " Notes on the Cocos-Keeling Islands " which are based on a residence of ten and a half months in 1941: they replace the manuscript of a book on the islands which was lost from Singapore during the Japanese occupation. These islands consist of one main atoll, Cocos Island, and a much smaller northern island, North Keeling. Like Christmas Island they are included for administration purposes in the Colony of Singapore. The author gives an interesting account of the history of their inhabitants and of the Clunies-Ross ownership from the early nineteenth century until the present-day.

Dato' Braddell continues his documentary " Notes on Ancient Times in Malaya." This series replaces his unfinished " Introduction to the Study of Ancient Times in the Malay Peninsula and the Straits of Malacca " which appeared in the Journal regularly from 1935 to 1941. Both essays are well-documented but certain authors are quoted without a critical comment and some aspects of early history are incompletely referenced. Thus when discussing the location of the biblical Ophir Dato' Braddell quotes the now discredited Mauch, Bent and Peters but makes no mention of the work of more serious archaeologists like McIver and Caton-Thompson. Again, the location of the Zimbabwe series of ruins in the Zambezi basin (page 6) is incorrect: all the important Rhodesian ruins with Indo-Malayan connections lie within the Sabi basin. Similarly Peters should not have been quoted as an authority for the Sabaean origin of the name Sabi without pointing out that the majority of archaeologists reject this connection. Nevertheless Dato' Braddell's essay is a scholarly one and if it invites controversy amongst the Journal's readers then no great harm will result. That it will stimulate interest in Malaya's pre-history and early history is certain.

The translation of " Two Brunei Charms " by MacBryan and Mohd. Yusof Shibli commences a series which, as Mr. Tom Harrison points out, may throw much light on the cultural history of Borneo.

One of the contributions by W. Linehan draws attention to an apparently artificial earthwork mound called " Belukar Bata " near Chini, in Pahang. This locality, important in Malay legend, is said to be rich in potsherds but has still to be investigated by an archaeologist. The same author has also written critically on the texts of the Malay Annals and a short account of " The Kings of 14th Century Singapore."

Several other short papers on a Keris Majapahit, Malay Cannon, the Aborigines of Ulu Kepasing and the various meanings of the word " Sejok " complete a most interesting publication which is cheap at $5.

E. F. A.

The Malayan Nature Journal.

The March issue of this Journal, the official organ of the Malayan Nature Society, provides interesting and varied reading. Mr. R. E. Holttum, Director of Gardens, Singapore, contributes an article entitled " Plants and Climate in Malaya " which draws attention to the individual response of plants to climate. Dr. Gibson-Hill writes on the Robber Crab which he found on both Christmas and Cocos-Keeling Islands. A well illustrated article by Mr. C. S. Ogilvie gives an extremely interesting account of the Chĕ Wông, a small tribe of semi-nomadic jungle dwellers in Pahang. Mr. Ogilvie wrote an article on these people for the first number of the Journal, and after an absence of over six years had the opportunity of revisiting them to enumerate them for the 1947 Census. Mr. M. R. Henderson of the Gardens Department, Singapore, contributes an article on the Balsams of the Malay Peninsula.

The annual subscription to the Journal is $10 which also confers membership of the Society. Single numbers of the Journal cost $3. Membership of the Society already exceeds 300 and should continue to increase if the high standard of the Journal is maintained.

H. L. B.

Notes and Comments.

Young Farmers' Club, Klang District, Selangor.

Through the initiative of the District Officer, Klang, Mr. M. C. ff. Sheppard, a Young Farmers' Club has recently been formed at Meru in the Klang District. Membership is restricted to 50, and there is already a considerable waiting list. Membership is also restricted to persons between 15 and 35, and no member over 30 may hold office.

The objects of the Club are:

(i) To bring together the young people of the district with a view to developing their individual knowledge and efficiency and their ability to serve the community;

(ii) To encourage among members a greater sense of the importance of the life of the country-side and agricultural pursuits;

(iii) To form a means of continued education not only in the art and science of farming but also in the art and science of living.

The first meeting of the Club was held on Sunday, 7th March, at which a talk on "Poultry Keeping" was given by Che Zakaria bin Abdul Rauf, Malay Agricultural Officer of the Department of Agriculture.

This is undoubtedly an interesting experiment, and if it proves successful should lead to the formation of similar Clubs throughout the Federation.

Public Gardens, Kuala Lumpur.

An interesting development in the Public Gardens, Kuala Lumpur, has been the introduction of peacocks, cranes and wild ducks and geese. On the 5th March, Lady Gent, the wife of H.E. the High Commissioner of the Federation of Malaya, released several peacocks and cranes which had been presented to His Excellency by His Highness the Tungku Mahkota of Johore. The wild ducks and geese were recently received from the Calcutta Zoo. There are also several *pelandok* (mouse-deer) in the Gardens.

These additions to the Gardens have roused considerable interest, and large numbers of people have visited the Gardens to view the birds.

Rice Prospects in Indo-China and Burma.

The following is taken from a recent article in the *Financial Times*:

INDO-CHINA.

"The outlook for Indo-China is the least hopeful of the three major exporting countries. Here, there is no prospect of rice shipments being resumed on any considerable scale until the civil war in the country has been brought to an end. Quite apart from the concentrated physical destruction caused by the Viet-Minh "scorched earth" operations in the north, in Tongking, the movement of rice and other goods to the ports has been disrupted by guerilla fighting all over the country. The richest rice-growing

area is in the south, in Cochin-China, but even there, where a greater measure of control has been established by the French, at least in the towns, convoys along the roads are slow and unsafe.

The I.E.F.C. expects to obtain no more than 10,000 tons of rice exports from Indo-China in the first six months of 1948. This compares with 650,000 tons exported in the same period of an average pre-war year."

BURMA.

"Her annual exports (Burma) before the war were a little more than those of Indo-China and Siam put together. There has been a decided improvement in Burmese production over the past year. The exportable surplus from current crop is estimated at 1,500,000 to 1,600,000 tons, compared with a total export of 800,000 tons in 1947. The 1948 figure is, however, still less than half the amount that was shipped abroad in a normal pre-war year.

Burmese rice output is held up by a variety of factors. First and foremost are the long-term effects of the destruction wrought during the Japanese occupation. Many of the paddy fields were allowed to revert to waste land and jungle. Rice land is peculiarly vulnerable to neglect; if it is left untended for as little as six months it loses its productivity. And it takes a long time to bring it back into cultivation again.

Large quantities of agricultural machinery are needed for this—for the Burmese rice growers are at present suffering from a shortage of labour —and even more important an increase in the number of draught animals on the rice fields. Cattle were destroyed indiscriminately during the war, and there is now a shortage of draught power on the land already available for cultivation. Several years are expected to elapse before these difficulties have been finally overcome. It is not anticipated that Burma will regain its pre-war level of output much before 1951. That is on the most favourable assumptions—that political and social conditions are stabilised during the period. These have a direct bearing on the output of the Burmese agricultural labourer. Insecurity and lawlessness in the country have made him reluctant to go into the more remote districts. Except in the populous areas, he keeps to the roads and works the land which is within easy reach of the roads. A more extensive cultivation of the rice fields will occur only if the Government of Burma manages to establish its authority over the whole country more firmly than it has done hitherto."

Conditions in Java and Sumatra.

The following information is extracted from Bulletins published in March, 1948, by the Consulate-General of The Netherlands.

Java.

Rubber.—Of the 394 estates within the demarcation line, covering a total area of 565,000 acres, 188 (225,000 acres) are back in administration. Of the latter number, 115 have resumed production.

Tea.—Of the 229 estates (total area 60,000 acres), 93 are back in administration, of which 39 are again producing.

Coffee.—The total area of the coffee plantations back in administration amounts to 52,500 acres.

Deforestation.—Data concerning deforestation in Java and Madura give cause for alarm. Of the total forest area in West Java, 450,000 acres have been lost, which averages 20 per cent.; artificial re-afforestation will take from 30 to 40 years. It is expected that the same percentage applies to the remaining parts of Java and Madura. An estimate puts the loss in these areas at 1,250,000 acres. As a result, the protection given by the forests has decreased and the forests' influence on checking the rain-water flow is disturbed. Apart from this, irrigation works will be facing water shortages during the periods of drought and will have to cope with devastating quantities of water at times of heavy rainfall. Moreover, the danger of floods which may damage irrigation works, bridges and roads has increased. Another serious consequence will be that the average yield of the rice field areas will be affected.

East Coast of Sumatra.

Reports received at the begining of this month state that rehabilitation is making steady progress. At the end of February, 173 estates cultivating perennial crops and 42 tobacco estates had been restored to their respective owners. Only three estates were not yet back in administration. The 173 estates, covering an area of 750,000 acres, are as follows: 127 rubber, 18 oil palm, 16 tea, 5 sisal, 7 coconut.

The following is the expected production for 1948 (in tons): palm oil 50,000, sisal 5,000, estate rubber 80,000, tobacco 1,000, tea 600.

Production still has to cope with many difficulties such as shortage of labour, transport facilities, spare parts for machinery, etc.

DEPARTMENTAL NOTES

Visit of Mr. G. F. Clay, C.M.G., O.B.E., M.C.

Mr. G. F. Clay, Adviser on Agriculture to the Secretary of State for the Colonies, is on a visit to Malaya, North Borneo and Sarawak, and arrived in Kuala Lumpur on the 6th April 1948. Mr. Clay expects to stay in the Federation until the end of April and will tour the Peninsula accompanied by the Director of Agriculture, Mr. Burnett.

Visit of Professor E. E. Cheesman.

Professor E. E. Cheesman, formerly Professor of Botany at the Imperial College of Tropical Agriculture, Trinidad, and now Deputy Director of East Malling Research Station, Kent, recently paid a visit to this country in connection with the possibilities of establishing a cacao industry in Malaya and adjacent territories. Professor Cheesman is an accepted authority on cacao and bananas, and the visit was arranged by the Colonial Office following representations being made by the Governments of Malaya.

Professor Cheesman arrived in Kuala Lumpur on 3rd December, 1947 and visited areas throughout the western side of the Peninsula, leaving Singapore on 29th December for Sarawak and Borneo. He returned to Malaya on 13th February, 1948, visited Kelantan and Trengganu and finally left for England via Ceylon on 8th March.

Mr. R. G. H. Wilshaw, Chief Research Officer, accompanied Professor Cheesman throughout his tours in Malaya, Sarawak and Borneo, and Mr. Gillett, representing Messrs. Cadbury Bros., Ltd., was also attached to the party.

It is understood that Professor Cheesman's report to the Colonial Office was submitted before the end of March.

Visit to Cocos-Keeling Islands and Christmas Island.

Mr. T. D. Marsh, Senior Agricultural Officer (Research), visited the Cocos-Keeling Islands and Christmas Island in April on the occasion of the visit to those islands by H.E. the Governor of Singapore. The object of Mr. Marsh's visit to the Cocos-Keeling Islands was to enquire into the agricultural economy of the islands with a view to suggesting how it might be extended by crops alternative to coconuts and the development of derived products. The question of the raising of poultry for the Singapore market was also to be investigated.

The visit to Christmas Island was included in the itinerary for an official agricultural opinion on its practicability for agricultural development and the settlement of surplus population from Cocos Islands.

College of Agriculture, Serdang.

The graduation ceremony of the One Year Course students who had completed their training was held at the College on the 27th March 1948.

Guests dined in hall as guests of the Students' Union and afterwards attended a concert and *ronggeng* which concluded the evening.

Thirty-one students graduated, of whom 20 were Federal Minor Scholars from all States and Settlements of the Federation, 4 were private students from the Federation, 4 were North Borneo Government students, and 3 were Sarawak Government students.

The opportunity was taken of presenting the Yong Yoon Choi Memorial Trophy, donated to the Students' Union by Mr. T. A. Rogers, to the winners, the Faulkner Dormitory.

Appointments.

Mr. R. Henderson, M.C., B.Sc., has been appointed to be an Agricultural Officer, Department of Agriculture, Federation of Malaya, with effect from 27th November 1947. Mr. Henderson arrived in Malaya on 22nd December 1947 and is stationed at the Central Experiment Station, Serdang, Selangor.

Mr. J. K. Coulter, B.Sc., B.Agr., has been appointed to be a Chemist, Department of Agriculture, Federation of Malaya, with effect from 18th December 1947. Mr. Coulter arrived in Malaya on 14th January 1948 and is stationed at Headquarters.

Mr. Gunn Lay Teik, Chemist, has been appointed to act as Senior Chemist with effect from 1st March 1948.

Mr. E. F. Allen, Agricultural Officer Perak South, has been appointed to act as Agricultural Officer, Cameron Highlands, in addition to his other duties with effect from 3rd January 1948.

Transfers.

Mr. H. M. James, M.C., Agricultural Officer, relinquished duty as Acting Personal Assistant to the Director of Agriculture on transfer to the post of Agricultural Officer, Malacca, with effect from 22nd December 1947.

Mr. R. G. Heath, Senior Agricultural Officer, relinquished duty as State Agricultural Officer, Selangor, on transfer to the post of State Agricultural Officer, Johore, with effect from 16th April 1948.

Mr. J. R. Curry, Agricultural Officer, relinquished duty as State Agricultural Officer, Pahang, on transfer to the College of Agriculture, Serdang, where he will act as Principal with effect from 19th April 1948.

Mr. R. Henderson, M.C., Agricultural Officer, relinquished duty as Agricultural Officer (Research), Central Experiment Station, Serdang, on transfer to the post of Agricultural Officer, Johore Central, with effect from 7th April 1948. Mr. Henderson will also act as Agricultural Officer, Johore North.

Leave.

Mr. H. D. Meads, Personal Assistant to the Director of Agriculture, returned from leave on 9th February 1948.

Mr. H. K. Ashby, Agricultural Officer, returned from leave on 9th February, 1948 and has assumed duty in the post of State Agricultural

Officer, Kelantan. Mr. Ashby is also Acting State Agricultural Officer, Trengganu.

Dr. W. N. Scott, Agricultural Officer, returned from leave on 11th February 1948 and has assumed duty as State Agricultural Officer, Negri Sembilan.

Mr. F. S. Banfield, Assistant Agricultural Officer, returned from leave on 14th April 1947 and resumed duty as Officer-in-Charge of the Botanic Gardens, Penang.

Mr. J. Cook, Agricultural Officer, has been granted 270 days leave, in addition to voyages, with effect from 22nd December 1947.

Mr. E. J. H. Berwick, Agricultural Officer, Food Production, has been granted 156 days leave, in addition to voyages, with effect from 9th February 1948.

Mr. J. L. Greig, Senior Agricultural Officer, has been granted 170 days leave, in addition to voyages, with effect from 21st February 1948.

Mr. P. G. Coleman, Agricultural Officer, has been granted 120 days leave, in addition to voyages, with effect from 23rd February 1948.

Mr. D. G. Jones, Agricultural Officer, has been granted 130 days leave, in addition to voyages, with effect from 23rd February 1948.

Dr. T. A. Buckley, Senior Chemist, has been granted 180 days leave, in addition to voyages, with effect from 1st March 1948.

Mr. V. Dawson, Principal of the College of Agriculture, Malaya, has been granted 180 days leave with effect from 18th April 1947.

Promotions.

The Right Honourable the Secretary of State for the Colonies has been pleased to approve the promotion of the following Agricultural Officers, Malayan Agricultural Service, to be Senior Agricultural Officers, Malayan Agricultural Service, with effect from the 1st April, 1946, inclusive: Messrs. J. Fairweather, J. W. Jolly, R. G. Heath, J. L. Greig, A de K. Frampton, J. R. P. Soper.

Retirements.

Dr. G. Bryce, Agricultural Officer, relinquished duty as State Agricultural Officer, Johore, to proceed on leave prior to retirement with effect from 19th April 1947.

Mr. P. V. Ormiston, Agricultural Officer, has relinquished his appointment owing to ill-health. Mr. Ormiston left Malaya on 13th April 1948.

Statistical.

MARKET PRICES

March 1948.

Rubber.—There was a decline in the Singapore monthly average price of No. 1 R.S.S. Spot loose during the first quarter of the year. January opened at 43⅞ cents per lb. and after an early improvement to 45⅛ cents the price decreased to 41⅝ cents on the last day giving an average of 42.42 cents per lb. for the month. During February the price gradually declined to 39 cents per lb. on the last day, giving an average price of 40.12 cents. After staying fairly constant under 40 cents for the first half of March the price slightly increased in the second half and the month closed with the price at 41⅜ cents, the average being 39.67 cents per lb.

The average prices paid in London and New York were: London, January 13.21, February 12.72 and March 12.03 pence per lb.: New York, January 21.88, February 20.41 and March 20.2 cents gold per lb.

The average prices paid for small-holders' rubber at three centres during the first quarter of 1948 are given in Table I.

Table I.

Average Monthly Price Paid by Local Dealers for Small-Holders' Rubber, January-March, 1948.

(Dollars per picul of 133⅓ lbs.)

Grades	Kuala Kangsar, Perak.			Kuala Pilah, Negri Sembilan.			Batu Pahat, Johore.		
	Jan.	Feb.	Mar.	Jan.	Feb.	Mar.	Jan.	Feb.	Mar.
Smoked Sheet ..	49.63	46.33	46.20	49.38	45.56	44.25	46.53	45.20	42.63
Unsmoked Sheet ..	43.13	38.33	37.60	44.38	44.69	37.75	32.28	40.36	38.28
Scrap ..	22.38	19.83	20.10	14.00	13.38	12.63	15.19	13.31	14.25

Palm Oil. The present United Kingdom Ministry of Food price for palm oil is £80 per ton, F.O.B. In addition to this price buyers pay export duty.

Tea.—The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 6th April 1948, of the Colombo Brokers' Association, are as follows, in rupees per lb.:—High Grown Teas Rs. 1.79, Medium Grown Teas Rs. 1.53, Low Grown Teas Rs. 1.53, average all grades Rs. 1.64. There is, in addition to the above prices, an export duty of 38 rupee cents per lb. which is payable by the buyer.

The retail price of Malayan tea (Boh) is $2 per lb.

Derris.—In February the Singapore price per picul for derris of 5 per cent. rotenone content was $60-$61, delivered loose to a Singapore godown.

Rice.—The Government controlled retail price of rice continues to be $30 per picul and the ration 2 katis per week per person in both the Federation of Malaya and the Colony of Singapore.

Padi.—The Government guaranteed price per picul of padi delivered at the mill is $20 per picul and for padi purchased in the field $19.50.

Tobacco.—The price for No. 1 cured leaf in Kelantan in March was $600 per picul, a decrease of $50 per picul on the previous month. The prices of 2nd and 3rd quality in March were $450 and $300 respectively. The March prices in Malacca for cured leaf were as follows:—1st grade $130, 2nd grade $100, 3rd grade $80.

Table II.

Singapore Prices of Various Agricultural Products.

Product	March, 1948			February 1948	Average Price 1947
	Highest	Lowest	Average	Average	
	per picul $	per picul $	per picul $	per picul $	per picul $
Copra:					
Sundried No. 1 ..	42.00	38.50	40.13	40.77	21.28
Coconut Oil ..	74.00	72.00	72.61	73.67	35.49
Coffee:					
Padang Bali No. 1 ..	*	*	*	87.00	109.10
No. 2 ..	*	*	*	83.00	100.66
Palembang No. 1 ..	75.00	74.00	74.96	81.00	65.13
Sourabaya No. 1 ..	83.00	81.50	82.93	98.00	79.15
Pepper:					
Muntok White ..	154.00	146.00	149.39	152.13	124.65
Sarawak ..	153.00	145.00	148.39	151.31	116.85
Cloves:					
Indian ..	44.00	44.00	44.00	44.00	41.85
Sumatra ..	47.00	47.00	47.00	47.00	51.70
Gambier:					
Rounds No. 1 ..	125.00	125.00	125.00	139.61	130.81
No. 2 ..	*	*	*	*	115.68
Sago Flour:					
Lingga ..	17.00	15.25	16.10	15.46	16.25
Tapioca Flour:					
Malayan No. 1 ..	34.00	34.00	34.00	34.00	28.15
No. 2 ..	*	*	*	*	24.22

* Not quoted.

FEDERATION OF MALAYA PRODUCTION OF PALM OIL AND KERNELS.

(In long tons as declared by Estates)

Month 1948	Palm Oil	Palm Kernels
January	3,821.9	664.1
February	3,659.8	677.9
Total Jan.-Feb. 1948 ..	7,481.7	1,342.0
Total Jan.-Feb. 1947 ..	4,555.1	629.4
Total for year 1947 ..	39,115.0	5,737.2

Stocks on estates as at 29th February, 1948, were: palm oil 3,792 tons, palm kernels 561 tons.

In February 34 estates (planted acreage 71,410 acres) were in production out of a total of 46 oil palm estates (planted acreage 78,405 acres).

MALAYAN AGRICULTURAL EXPORTS, OCTOBER-DECEMBER, 1947.

Product	Net Exports in Tons.		
	Year 1946	Year 1947	October, November and December, 1947
Arecanuts	9,000	12,507	5,071
Coconuts fresh†‡ ..	4,167†	62,873†	6,040†
Coconut oil‡	8,008	41,112	11,218
Copra‡	34,213*	45,439*	11,332*
Copra cake	2,226*	5,260*	907*
Gambier, all kinds ..	427*	1,156	382
Palm kernels	153	5,245	1,802
Palm Oil	8,179	43,325	11,547
Pineapples, canned ..	13	2,611	770
Rubber¶	403,207¶	645,229¶	178,064¶
Sago,—flour	4,168	5,958	2,754
„ —pearl	673	2,404	7,998
„ —raw	1,672*	6,415*	511*
Tapioca,—flake ..	20*	52	19
„ —flour ..	822	6,490	661
„ —pearl ..	2,454	7,205	1,736
Derris	441	243	50
‡Copra equivalent ..	21,117*	22,625	7,018

† hundreds in number. * net imports. ¶ Malayan Union production.

FEDERATION OF MALAYA RUBBER STATISTICS.

Estates of 100 Acres and over. Production, February, 1948.

In dry tons.

STATE	PRODUCTION						STOCKS		PRODUCTION OF PRESERVED FIELD LATEX, CONCENTRATE LATEX AND REVERTEX
	European	Chinese	Indian	Others	Total	Jan./Feb. 1948	Beginning of Month	End of Month	
(1)	(2)	(3)	(4)	(5)	(6)	(7)			
Perak ..	4,027	330	230	18	4,605	10,578	4,403	4,167	1
Selangor ..	4,552	265	81	2	4,900	11,491	5,387	4,864	318
N. Sembilan ..	3,640	253	137	84	4,114	10,058	3,666	3,261	640
Pahang ..	1,019	489	92	—	1,600	3,419	1,375	1,347	—
Malacca ..	1,194	271	91	—	1,556	3,329	1,335	1,277	157
Penang & P. Wellesley	278	68	3	—	349	844	452	426	—
Johore ..	5,165	941	223	489	6,818	13,313	4,112	4,365	1,436
Kedah ..	3,259	393	116	24	3,792	8,690	3,200	2,854	1,144
Perlis ..	—	2	22	—	24	55	30	31	—
Kelantan ..	510	67	—	18	595	1,087	435	363	—
Trengganu ..	121	52	—	3	176	333	107	137	—
(Singapore)* ..									180
Total ..	23,765	3,131	995	638	28,529	63,197	24,502	23,092	3,876

Notes:—1. Figures for production of prepared latex for export, are included in the month's production figures, columns 2 to 6.

2. Production by estates of less than 100 acres for February, 1948, was estimated to be 22,121 tons. Total estimated smallholding production January and February, 1948, 49,442 tons.

3. Stocks on estates of less than 100 acres are not ascertained.

4. *Johore latex processed in Singapore.

5. The above forms part of the February rubber statistics published by the Acting Registrar of Statistics, Federation of Malaya, at Kuala Lumpur, on 22nd March, 1948.

FEDERATION OF MALAYA RUBBER STATISTICS.

Acreages of Tappable Rubber Actually Tapped and not Tapped on Estates of 100 Acres and over for the Month ending 29th February, 1948.

STATE	Estimated Acreages of Tappable Rubber (9) + (11)	Acreages of tappable Rubber not tapped				Area of tappable rubber never been tapped (b)		Total Area not tapped (3) + (5) (c)		Total Area tapped during the month (c)		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping (a)									
		Acreage	% of (3) to (2)	Acreage	% of (5) to (2)	Acreage	% of (7) to (2)	Acreage	% of (9) to (2)	Acreage	% of (11) to (2)	Acreage	% of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Perak ..	275,035	987	.4	29,497	10.7	7,527	2.7	30,484	11.1	244,551	88.9	25,126	9.1
Selangor ..	325,868	946	.3	28,849	8.8	9,034	2.8	29,795	9.1	296,073	90.9	22,125	6.8
N. Sembilan ..	259,845	2,827	1.1	40,556	15.6	12,769	4.9	43,383	16.7	216,462	83.3	8,750	3.4
Pahang ..	97,915	744	.8	19,987	20.4	8,917	9.1	20,731	21.2	77,184	78.8	5,235	5.3
Malacca ..	121,469	989	.8	13,299	10.9	4,470	3.7	14,288	11.8	107,181	88.2	7,633	6.3
Penang & P. Wellesley ..	29,434	430	1.4	4,904	16.7	1,814	6.2	5,334	18.1	24,100	81.9	4,872	16.5
Johore (d) ..	471,068	9,129	1.9	72,316	15.4	29,976	6.4	81,445	17.3	389,623	82.7	31,343	6.6
Kedah ..	205,715	638	.3	19,645	9.5	6,540	3.2	20,283	9.8	185,432	90.2	25,037	10.0
Perlis ..	1,782	—	—	253	14.2	75	4.2	253	14.2	1,529	85.8	300	16.8
Kelantan ..	30,105	362	1.2	8,320	27.6	1,483	4.9	8,682	28.8	21,423	71.2	760	2.5
Trengganu ..	15,393	510	3.3	5,090	33.1	2,048	13.3	5,600	36.4	9,793	63.6	808	5.2
Total ..	1,833,629	17,562	1.0	242,716	13.2	84,653	4.6	260,278	14.2	1,573,351	85.8	131,989	7.2
Total January, 1948 ..	1,823,818	15,559	.9	248,429	13.6	82,045	4.5	263,988	14.5	1,559,830	85.5	125,976	6.9

Notes:—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes area on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Acres of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered estates only.

(e) This table was published by the Acting Registrar of Statistics, Federation of Malaya, on 24th March, 1948.

COCONUT OIL AND COPRA CAKE STATISTICS.

Stocks and Production of Coconut Oil and Copra Cake for the month of February, 1948, as declared by Principal Oil Mills only.

(in tons)

	Production			Stocks at end of month	
	Copra Treated	Coconut Oil Expressed	Copra Cake (Poonac) manufactured	Coconut Oil	Copra Cake
Singapore ..	9,250	5,203	3,613	3,041	526
Federation of Malaya ..					
Perak ..	1,441	643	651	93	32
Johore ..	1,032	496	415	55	27
Negri Sembilan ..	32	16	13	10	7
Selangor ..	1,038	547	412	98	151
Malacca ..	137	71	45	22	11
Penang and P. Wellesley ..	2,508	1,428	878	2,443	31
Kelantan ..	33	18	14	—	7
Pahang ..	10	5	4	1	1
Total Federation of Malaya ..	6,231	3,224	2,432	2,722	267
Total Malaya ..	15,481	8,427	6,045	5,763	793

Direct Foreign Imports and Exports of Malaya (Singapore and the Federation of Malaya, excluding trade between these two territories) during the month of February, 1948.

(to the nearest ton)

IMPORTS				EXPORTS			
Fresh Coconuts (Numbers)	Copra	Coconut Oil	Copra Cake	Fresh Coconuts (Numbers)	Copra	Coconut Oil	Copra Cake
300	5,715	226	126	237,600	1,485	3,849	—

Notes:—(a) These tables were published by the Acting Registrar of Malayan Statistics on 14th April, 1948.

(b) Federation of Malaya figures are as compiled and supplied by the Acting Registrar of Statistics, Federation of Malaya.

(c) Details of small-holding production and stocks and dealers' stocks are not available.

METEOROLOGICAL SUMMARY, MALAYA, DECEMBER, 1947.

Locality.	Air Temperature degrees Fahrenheit							Earth Temperature		Rainfall							Bright Sunshine		
	Means of			Absolute Extremes								Number of days							
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot °F	At 4 feet °F	Total	Most in a day. Amt.	Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Total	Daily Mean	Per cent.
										ins.	m.m.	ins.							
Ipoh, Perak ..	87.2	71.5	79.3	93	68	77	74			14.61	371.1	3.73	24	21	3				
Port Swettenham, Selangor	86.3	72.5	79.4	91	69	77	74	82.9	84.4	10.81	274.6	2.18	25	20	1	1			
Sitiawan, Perak ..	86.1	72.5	79.3	90	69	77	75			6.44	163.6	2.10	20	18	15				
Kuala Lipis, Pahang ..	83.2	71.5	77.3	90	69	74	74	80.3	82.4	16.25	412.8	2.59	24	22		22			
Kuantan, Pahang ..	82.7	71.1	76.9	90	68	74	73			42.50	1079.5	7.84	23	21	2	1			
Bayan Lepas, Penang ..	85.6	73.4	79.5	90	71	76	76			7.92	201.2	2.06	20	16	3				
Malacca ..	84.2	73.1	78.7	88	70	76	75			5.69	144.5	1.55	18	11	1				
Mersing, Johore ..	81.6	73.7	77.7	84	71	76	78			22.79	578.9	5.18	24	21	1		4		
Alor Star, Kedah ..	86.3	71.8	79.1	91	68	77	74			7.01	178.1	2.04	17	12	3				
K. Trengganu, Trengganu	83.0	72.6	77.8	87	69	75	76			16.55	420.4	2.79	24	22		2	5		
HILL STATIONS.																			
Fraser's Hill, Pahang 4268 ft. ..	68.1	61.0	64.5	75	58	62	63	65.5		16.60	421.6	2.62	24	23	2	14			
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	70.3	58.3	64.3	76	53	63	62	67.6		13.87	352.3	2.56	24	24		1			

Compiled from Returns supplied by the Meteorological Branch, Malaya.

METEOROLOGICAL SUMMARY, MALAYA, JANUARY, 1948.

Locality.	Air Temperature degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes						Total		Most in a day.	Number of days					Total	Daily Mean	Per cent.
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot °F	At 4 feet °F			Amt.	Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
										ins.	m.m.	ins.						hr.		
Ipoh, Perak ..	89.8	71.2	80.5	94	69	84	74			3.19	81.0	1.15	11	9				198.45		
Port Swettenham, Selangor	87.5	71.6	79.5	92	67	82	74	83.5	84.0	6.23	158.2	2.00	18	14	1					
Sitiawan, Perak ..	87.5	71.7	79.6	92	69	82	74	83.2		12.89	327.4	3.44	18	16	3					
Kuala Lipis, Pahang ..	83.9	70.5	77.2	89	68	77	72	81.1	81.9	7.98	202.7	0.93	22	20		16				
Kuantan, Pahang ..	83.6	71.1	77.3	89	67	76	74			10.43	264.9	1.55	22	18						
Bayan Lepas, Penang ..	87.3	73.7	80.5	90	71	82	77			2.71	68.8	1.01	8	6	4					
Malacca ..	85.3	73.3	79.3	90	71	76	75			4.51	114.6	1.94	13	9	1		2			
Mersing, Johore ..	80.9	73.5	77.2	84	70	75	77			18.81	477.8	6.51	21	18			8			
Alor Star, Kedah ..	87.5	70.7	79.1	92	67	84	75			2.34	59.4	2.18	4	3						
K. Trengganu, Trengganu	82.6	72.8	77.7	85	67	78	77			2.59	65.8	0.60	18	14		3	4			
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. ..	67.1	59.9	63.5	74	57	61	62	67.6		10.61	269.5	1.62	23	22		24				
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	70.3	56.8	63.5	76	47	65	62	67.1	68.7	4.19	106.4	1.14	17	15		2				

Compiled from Returns supplied by the Meteorological Branch, Malaya.

METEOROLOGICAL SUMMARY, MALAYA, FEBRUARY, 1948.

Locality.	Air Temperature degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes						Total		Most in a day.	Number of days					Total	Daily Mean	Per cent.
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot °F	At 4 feet °F			Amt.	Precipitation .01 in or more	Precipitation .04 in or more	Thunder storm	Fog morning obs.	Gale force 8 or more			
										ins.	m.m.	ins.								
Ipoh, Perak ..	91.3	72.1	81.7	94	70	87	74			7.10	180.3	2.22	16	12	5					
Port Swettenham, Selangor	88.4	72.4	80.4	93	70	80	74	83.8	84.3	6.63	168.4	2.21	21	7	2	2				
Sitiawan, Perak ..	88.2	73.0	80.6	91	71	81	75	83.9		6.38	162.1	1.04	16	13	4	5				
Kuala Lipis, Pahang ..	87.1	71.4	79.3	90	68	82	73	82.3	82.3	4.35	110.5	0.86	14	11	1	17				
Kuantan, Pahang ..	85.9	70.3	78.1	89	67	80	73			7.35	186.7	2.65	19	16						
Bayan Lepas, Penang .	88.2	74.2	81.2	91	73	86	76			4.81	122.2	1.32	12	9	5					
Malacca ..	86.7	73.5	80.1	90	70	78	75			10.39	263.9	3.02	16	4	1		1			
Mersing, Johore ..	82.9	73.5	78.2	85	70	78	77			7.82	198.6	3.57	13	10						
Alor Star, Kedah ..	92.2	70.7	81.5	95	67	87	74			3.08	78.2	1.75	4	3	1					
K. Trengganu, Trengganu	85.1	72.7	78.9	87	69	83	77			1.54	39.1	0.37	14	11		5				
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. ..	70.3	60.9	65.6	75	58	65	63	69.3		8.23	209.0	1.52	18	18	2	22				
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	72.7	54.9	63.8	77	48	69	62	67.7	68.9	5.69	144.5	1.80	17	14	1					

Compiled from Returns supplied by the Meteorological Branch, Malaya.